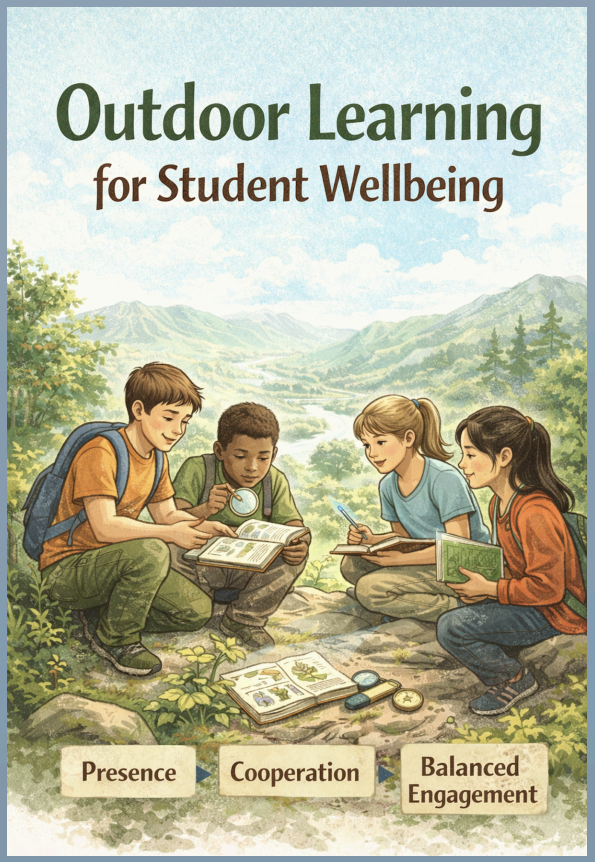
Co-funded by the European Union

Sustainability Education: Personal Growth, Physical and Mental Wellbeing through Outdoor Activities



CONNECT Handbook 2

Erasmus+ projekt:
Cultivating Outdoor Nature-based Education for Competence and Teaching

2024-2-HU01-KA210-SCH-000265656

This project has been funded with support from the European Commission under the Erasmus+ Programme.

About the project

This handbook has been developed within the framework of the Erasmus+ project CONNECT: Cultivating Outdoor Nature-based Education for Competence and Teaching. Its primary target group is teachers working in secondary education, while remaining adaptable to primary education settings and teacher training contexts. The chapter responds directly to the project's core concerns: increasing stress among teenagers, growing social isolation, declining social skills, and the urgent need to support students' mental wellbeing while fostering inclusion and key competences through innovative teaching approaches.

Nature-Based Learning as a Response to Current Educational Challenges

Research and practice across Europe indicate that today's teenagers face unprecedented pressures. Excessive screen time, reduced contact with nature, academic demands, social comparison and uncertainty about the future have contributed to rising levels of stress, emotional overload and disengagement from learning. Schools are increasingly challenged to respond to these trends using methods that go beyond traditional classroom instruction.

Nature-based outdoor learning offers a concrete and experiential response to these challenges. By moving learning outside the classroom, teachers can create more dynamic, engaging and human-centred educational experiences. Outdoor environments provide rich stimuli for learning while simultaneously supporting physical, emotional and mental wellbeing. As highlighted in the project application, contact with nature can reduce stress, improve resilience and increase motivation to learn, particularly when combined with hands-on, participatory activities .

Making Outdoor Learning Inclusive

Inclusion is a central priority of the Erasmus+ programme and a guiding principle of this project. Inclusive outdoor learning does not mean treating all students the same way; rather, it means creating conditions where every student can participate meaningfully, regardless of ability, background or emotional state.

Nature-based activities naturally lend themselves to inclusion because they allow for multiple forms of engagement. Observation, movement, creative expression, cooperation and reflection can coexist within the same activity. This flexibility is particularly valuable in secondary education settings where classes often include students with diverse learning profiles, cultural backgrounds and levels of confidence.

Outdoor learning environments tend to reduce performance pressure and rigid hierarchies. Students who may struggle in academically demanding classroom settings often find new ways to contribute and succeed outdoors. This supports the project's aim of reducing isolation and social exclusion among teenagers by fostering shared experiences and a sense of belonging.

Supporting Social-Emotional Competences Through Experience

A key objective of the CONNECT project is the development of transversal and social-emotional competences such as communication, collaboration, self-awareness and resilience. These competences are not acquired through instruction alone but through experience, reflection and interaction with others.

Outdoor learning creates natural opportunities for cooperation, problem-solving and shared responsibility. Group tasks such as exploring local ecosystems, participating in sustainability actions or reflecting together during outdoor activities encourage students to listen to one another, negotiate roles and manage emotions. These experiences strengthen social skills that are essential for both personal wellbeing and active citizenship.

Importantly, nature-based learning also supports emotional regulation. Time spent outdoors can help students slow down, reconnect with their senses and shift attention away from constant digital stimulation. Simple activities such as short wellbeing walks, sensory exploration or outdoor reflection circles can support self-management and emotional balance, directly addressing the project's concern about declining mental wellbeing among teenagers .

Working with Mixed-Ability Groups

Secondary school teachers increasingly work with mixed-ability groups where differentiation is essential. Outdoor learning supports differentiation in a non-stigmatising way. Activities can be open-ended, allowing students to engage at different depths and paces. One student may focus on factual observation, another on creative expression, and another on emotional reflection, all within the same learning framework.

Teachers are encouraged to focus on process rather than outcomes and to value effort, cooperation and reflection. Pair and small-group work further supports inclusion and social learning, helping students build confidence and interpersonal skills while learning from one another.

Low-Cost, Low-Risk and Sustainable Implementation

A common barrier to outdoor learning is the perception that it requires significant resources, time or specialised training. In reality, many effective nature-based activities are low-cost and easy to implement. Schoolyards, nearby parks or local green spaces can become meaningful learning environments when used intentionally.

Short, regular outdoor activities are often more impactful than occasional large projects. Even ten minutes spent outside can contribute to wellbeing and engagement. Risk management should focus on awareness and responsibility rather than avoidance, with clear boundaries and shared rules supporting both safety and autonomy.

Aligning Practice with Erasmus+ Priorities

The approaches presented in this handbook directly contribute to Erasmus+ priorities on wellbeing, inclusion and the development of key competences. By integrating nature-based outdoor learning into everyday teaching practice, educators support students' personal growth, social cohesion and environmental awareness. At the same time, teachers strengthen their own professional competences by adopting innovative, experiential methods that respond to contemporary educational needs.

Ultimately, outdoor learning is not an additional burden but a powerful pedagogical resource. When used thoughtfully, it helps teachers create inclusive, supportive and engaging learning environments that empower young people to become resilient, socially connected and environmentally responsible future citizens.

PART I – THEORETICAL FOUNDATIONS

Chapter 1: Young people, the body and wellbeing in sedentary world

For much of human history, daily life involved movement as a natural and unavoidable part of existence. Walking, carrying, working outdoors, adjusting to weather and daylight were not separate from learning or living; they were the conditions through which people understood the world and themselves. For today's young people, this relationship between body, movement and environment has changed profoundly. Adolescence now unfolds largely indoors, seated, and mediated by screens. As a result, physical and mental wellbeing are increasingly shaped by sedentary routines and digital rhythms rather than by embodied experience and contact with the natural world.

Box 1: Human Movement – A Short Evolutionary Perspective

For most of human history, movement was not a choice but a necessity. Early human societies, including hunter-gatherer communities, depended on daily physical activity for survival. People walked long distances to find food and water, tracked animals, gathered plants, climbed, carried, and adapted constantly to changing landscapes and weather conditions. Anthropological research suggests that hunter-gatherers often covered several kilometres a day on foot, engaging in varied, moderate-intensity movement spread throughout the day.

This movement was not structured exercise, but functional activity integrated into everyday life. Bodies developed strength, endurance, coordination and balance through natural tasks rather than repetitive or isolated movements. Importantly, physical activity was closely linked to sensory awareness and environmental connection. Humans learned to read the land, notice subtle changes in terrain, sounds or animal behaviour, and adjust their actions accordingly.

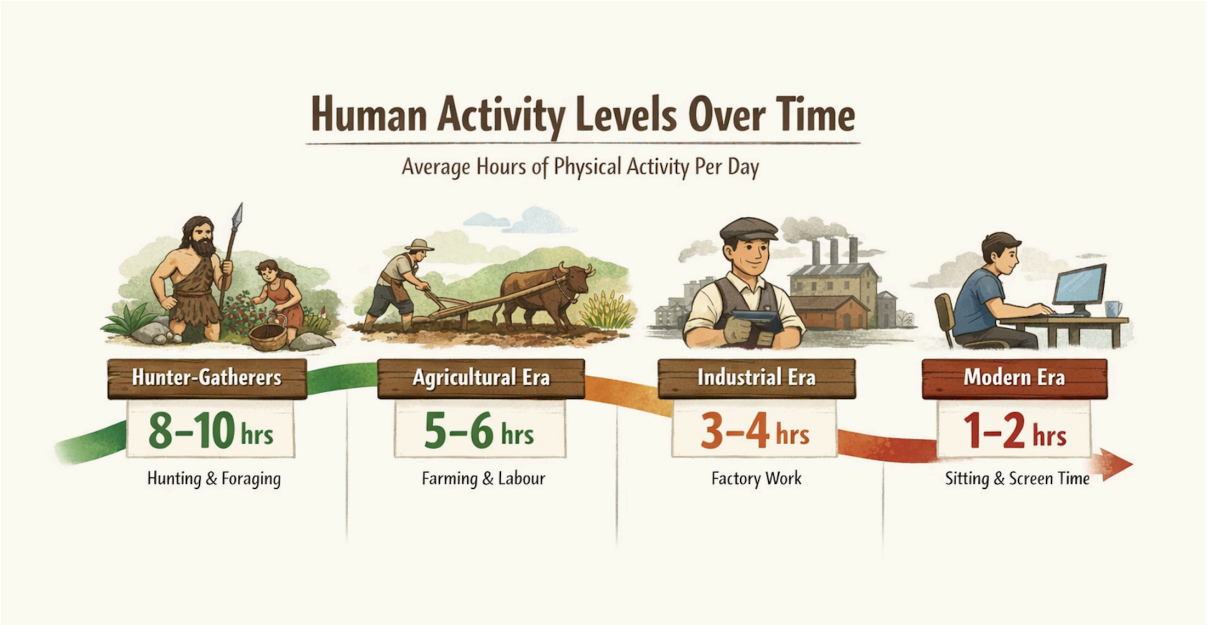
Over time, as societies became more settled and later industrialised, physical activity gradually decreased. The introduction of agriculture, mechanisation and eventually digital technologies reduced the need for everyday movement. In contemporary societies, many essential tasks can be completed while sitting, and physical effort is no longer required for survival.

This evolutionary mismatch between bodies shaped for movement and lifestyles dominated by sitting and screen use helps explain why inactivity affects both physical and mental wellbeing. Human bodies and nervous systems evolved in close interaction with movement and natural environments. When these elements are missing from daily life, imbalance can occur, affecting energy levels, mood, attention and overall health.

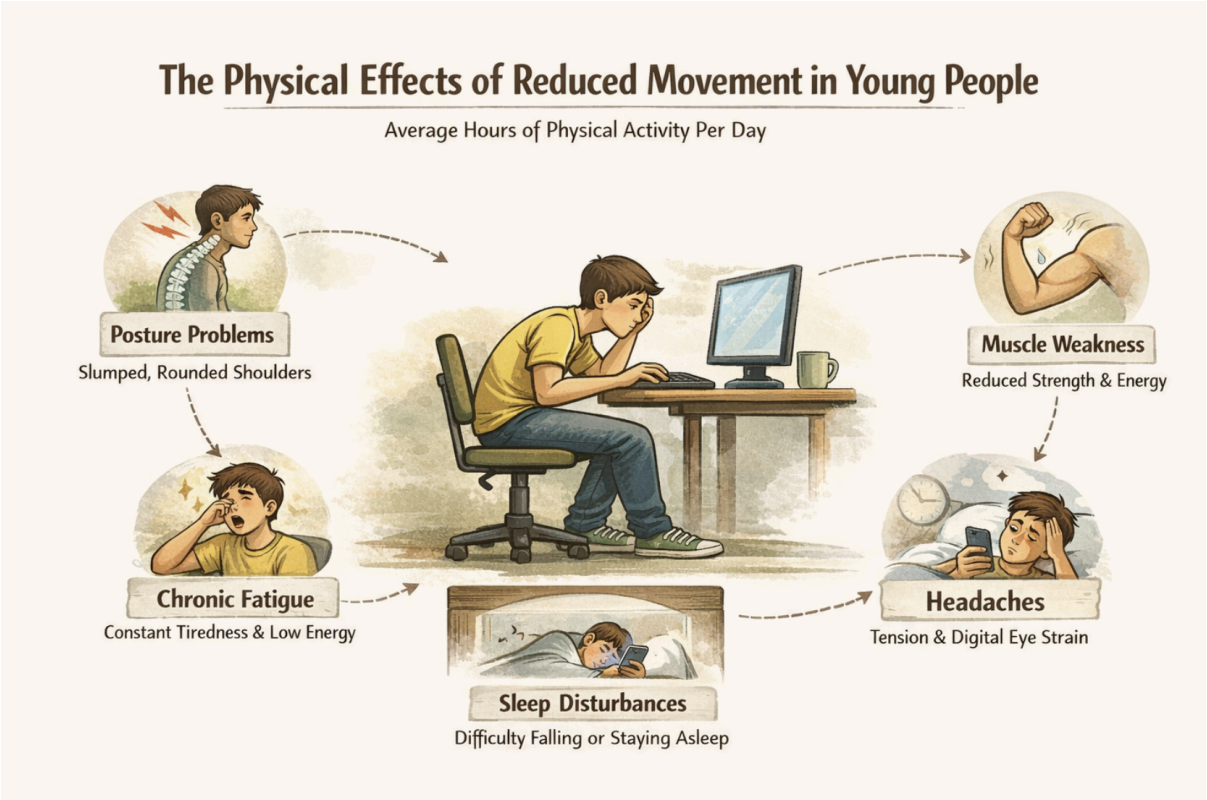
Understanding this evolutionary context helps educators recognise that the need for movement is not a trend or preference, but a fundamental human requirement. Outdoor learning and nature-based activities can be seen as ways of reconnecting education with the conditions under which human learning and wellbeing originally developed.

A typical school day for a teenager involves long hours of sitting, moving between classrooms, desks and screens. Learning is often confined to indoor spaces where the body plays a minimal role beyond maintaining posture and focus. Outside of school, digital devices continue to dominate daily life. Social interaction, entertainment, information and even rest

are increasingly screen-based. While digital technologies bring undeniable benefits, their cumulative effect has significantly reduced everyday physical activity and spontaneous movement, particularly during adolescence. The drawing below shows human activity changed over time.

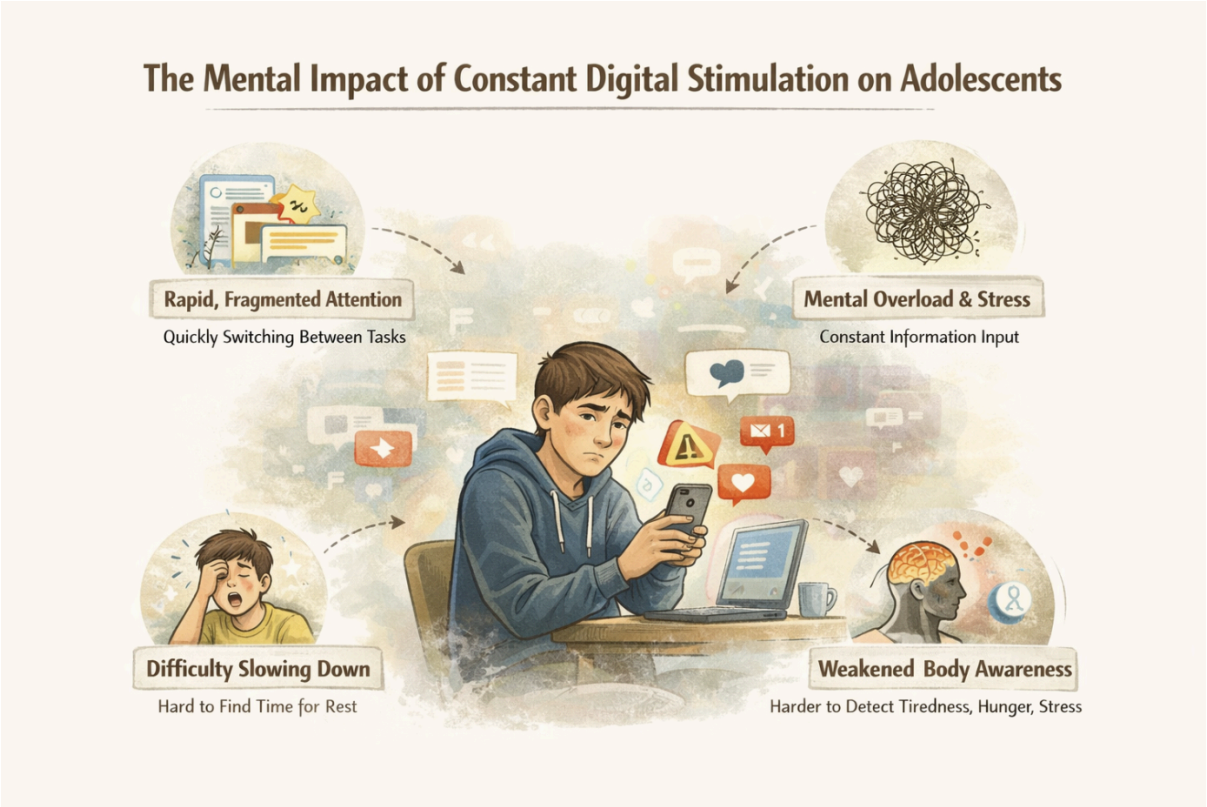


This shift toward sedentary lifestyles has important consequences for both physical and mental wellbeing. Physically, reduced movement affects posture, muscle strength, coordination and energy levels. Many young people experience chronic fatigue, tension, headaches or sleep disturbances, even when no medical condition is present. The body, designed for movement and variation, is instead held in static positions for extended periods. Over time, this creates a disconnect between physical needs and daily routines. The drawing below presents the overall impact of the change in human being lifestyle on their mood.



Mental wellbeing is closely linked to these bodily realities. When movement is limited, the regulation of stress and emotions becomes more difficult. The body plays a crucial role in processing tension, excitement and overload. Without opportunities to move, stretch, walk or breathe deeply, emotional states can accumulate without release. This often manifests as irritability, restlessness, anxiety or difficulty concentrating. In such conditions, learning becomes more demanding, and motivation can decline.

The digitalisation of everyday life further intensifies this dynamic. Continuous exposure to screens stimulates attention in rapid, fragmented ways, leaving little space for mental rest or reflection. Adolescents move quickly between messages, images and tasks, often without clear transitions. This constant stimulation affects the nervous system, making it harder to slow down, focus deeply or recognise bodily signals such as tiredness, hunger or stress. Over time, young people may lose awareness of their own physical states, becoming disconnected from sensations that support self-regulation and balance.



What is often overlooked in educational contexts is how closely learning, wellbeing and physical state are intertwined. A body that is tired, overstimulated or underused struggles to support sustained attention and emotional stability. When young people are expected to engage with complex topics such as sustainability, global responsibility or long-term futures, these expectations are placed on bodies and minds that may already be depleted. This can lead to disengagement, resistance or emotional withdrawal, not because students lack interest, but because their physical and mental resources are strained.

The absence of natural movement is also connected to a broader disconnection from the environment. Many adolescents have limited daily contact with outdoor spaces, changing weather, uneven ground or natural rhythms. Their experience of the world becomes increasingly abstract and mediated, rather than sensory and embodied. As a result, concepts such as nature, sustainability or environmental responsibility may feel distant or theoretical, rather than grounded in lived experience.

Nature-based movement offers a different rhythm. Walking outdoors, adjusting pace to terrain, responding to wind, temperature or sound requires a form of attention that is both physical and mental. Unlike structured indoor exercise, natural movement does not demand performance or efficiency. It invites presence. This kind of movement supports balance rather than output, and engagement rather than competition. For young people accustomed to static or digitally driven routines, even simple outdoor movement can feel unfamiliar at first, revealing how far everyday life has drifted from bodily needs.

Adolescence is a critical period for developing habits, self-awareness and relationships with the body. It is a time when young people form lasting patterns around activity, rest and self-care. If this phase is dominated by sedentary routines and disembodied learning, opportunities for developing healthy relationships with movement may be lost. Conversely,

when education intentionally reconnects learning with physical experience, it can help students rediscover movement as a source of wellbeing rather than obligation.

Box: Natural Light, Sleep Rhythms and the Impact of Artificial Light

Human sleep–wake rhythms are regulated by a finely tuned biological system known as the circadian rhythm. This internal clock is strongly influenced by exposure to natural light, particularly daylight in the morning and darkness in the evening. When the eyes are exposed to morning sunlight, the brain increases the production of serotonin, a neurotransmitter associated with alertness, positive mood and emotional stability. This helps the body wake up, regulate energy levels and prepare for cognitive activity during the day.

As daylight fades in the evening, the brain gradually shifts toward producing melatonin, a hormone that signals the body to slow down and prepare for sleep. Melatonin production is essential for falling asleep, maintaining deep sleep and allowing physical and mental recovery. In natural conditions, this cycle is synchronised with sunrise and sunset, supporting regular sleep patterns and overall wellbeing.

In contemporary lifestyles, this natural rhythm is increasingly disrupted by artificial light, particularly the blue light emitted by screens such as smartphones, tablets and computers. Exposure to artificial light in the evening suppresses melatonin production, delaying the body's natural readiness for sleep. As a result, many young people experience difficulty falling asleep, lighter sleep, or irregular sleep schedules, even when they feel physically tired.

This disruption affects more than sleep alone. Poor sleep quality is linked to reduced concentration, emotional instability, increased stress sensitivity and lower physical energy during the day. Over time, chronic sleep disruption can weaken the body's ability to regulate mood, stress and attention, contributing to fatigue and reduced wellbeing.

Regular exposure to natural daylight, especially in the morning and during outdoor activities, helps restore circadian balance. Time spent outdoors supports the natural alternation between serotonin production during the day and melatonin production at night. From an educational perspective, outdoor learning not only benefits attention and engagement in the moment, but also supports healthier daily rhythms that influence students' wellbeing beyond school hours.

Understanding the role of natural light highlights the importance of outdoor time as a biological need rather than a leisure activity. Reconnecting learning with daylight and natural rhythms can help young people restore balance in a world increasingly shaped by artificial light and constant digital stimulation.

In this context, sustainability education gains a new dimension. Sustainability is often framed in terms of future systems, policies or global outcomes. Yet sustainability also concerns how people live day to day, how they use their bodies, manage energy and maintain balance. A lifestyle that neglects physical wellbeing is difficult to sustain, both individually and collectively. Teaching sustainability without addressing the physical realities of young people risks reinforcing a gap between knowledge and lived experience.

Recognising the impact of sedentary, digital lifestyles does not mean rejecting technology or modern education. Rather, it invites a rebalancing. Outdoor and nature-based activities can reintroduce movement as a natural part of learning, not as an additional task but as a supportive foundation. By creating opportunities for walking, exploring, stretching and being

present outdoors, educators can help young people reconnect with their bodies and restore a sense of physical and mental coherence.

This chapter sets the stage for a broader exploration of how outdoor learning can support wellbeing through movement, balance and embodied experience. By understanding what is lost when everyday life becomes sedentary and disconnected from natural movement, educators are better positioned to design learning experiences that restore vitality, attention and a grounded sense of self. These foundations are essential not only for wellbeing, but also for meaningful engagement with sustainability as a lived and sustainable way of being in the world.

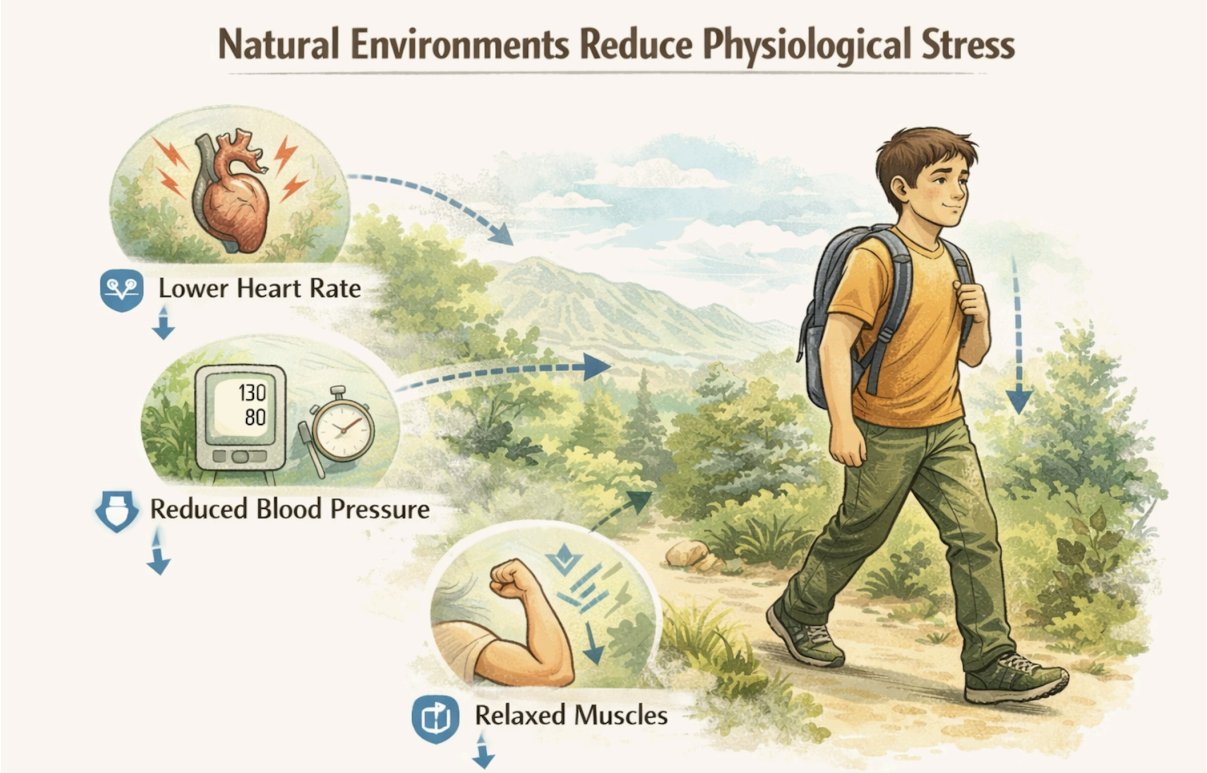
If these emotions are not acknowledged and addressed, they may lead to disengagement, denial, or emotional burnout. Students may feel that individual actions are meaningless in the face of global problems, which can reduce motivation and hope.
Young people's emotional responses to climate change are not limited to concern or motivation to act. A growing body of qualitative research shows that for many adolescents, climate change has become a source of deep emotional distress, discouragement, and loss of hope. Interviews and case studies across different countries reveal how awareness of environmental crises can shape young people's worldview, identity, and daily behaviour in powerful ways.
In a large international study based on in-depth interviews and surveys with young people aged 16–25 across ten countries, many participants described a pervasive sense of fear and uncertainty about the future (Hickman et al., 2021). Some students expressed the belief that environmental collapse was inevitable and that meaningful political action would come too late. This belief sometimes led to emotional withdrawal and disengagement rather than activism. A number of respondents reported thinking along the lines of "there is no future to plan for," which affected their motivation to study, work, or imagine long-term goals (Hickman et al., 2021).
Qualitative studies with European adolescents show similar patterns. Research conducted in Sweden and other Nordic countries found that some teenagers cope with climate anxiety by emotionally distancing themselves from the issue, expressing resignation rather than engagement (Ojala, 2012; Ojala, 2023). In interviews, students described moments of discouragement in which they questioned the value of personal effort, stating that individual actions felt meaningless in the face of global inaction. This form of emotional coping sometimes manifested as irony, indifference, or a focus on short-term enjoyment, reflecting a belief that "if the future is already lost, it makes sense to enjoy the present" (Ojala, 2012).
Other studies highlight how climate-related emotions can intersect with broader mental health vulnerabilities. In qualitative interviews with children and adolescents in Canada, participants

Chapter 2: Nature, movement and mental balance

Physical activity is widely recognised as beneficial for health and wellbeing, yet not all movement affects the body and mind in the same way. A walk in a forest, a lesson held in a park, or sustained outdoor activity often leaves young people feeling calmer, clearer and more balanced than comparable movement in indoor or artificial environments. This difference is not accidental. It reflects how human physiology, attention and emotional regulation respond to natural settings in ways that cannot be fully replicated indoors.
One of the most fundamental differences lies in sensory experience. Indoor environments tend to offer limited and repetitive sensory input: flat surfaces, artificial lighting, constant temperature, and predictable sounds. In contrast, natural environments provide rich, varied and dynamic stimuli. Uneven ground, changing light, wind, temperature shifts, natural sounds

and subtle movement require the body to adapt continuously. This low-level adaptation activates coordination, balance and spatial awareness without conscious effort, engaging the body in a way that feels organic rather than forced.

This sensory richness has a direct effect on the nervous system. Natural environments tend to reduce physiological stress responses by lowering heart rate, blood pressure and muscle tension. Movement outdoors is often rhythmic rather than mechanical, supporting a shift from heightened alertness toward a more balanced state of attention. For adolescents who spend much of their day in overstimulating or highly controlled settings, this shift can be deeply restorative.



Attention functions differently in nature as well. Indoor environments frequently demand sustained, directed attention, requiring students to filter out distractions and maintain focus for long periods. This type of attention is cognitively demanding and can lead to mental fatigue, especially when combined with screen exposure. Natural environments, by contrast, support a softer form of attention. Visual patterns such as trees, water or clouds capture interest without overwhelming it. This allows the brain to rest while remaining engaged, restoring cognitive resources rather than depleting them.

Movement in natural settings also changes the way effort is perceived. Physical activity indoors is often associated with performance, measurement or comparison, whether through sports, fitness exercises or structured routines. Outdoors, movement is more often embedded in purpose: walking to explore, climbing to gain perspective, carrying objects as part of a shared task. This reduces self-consciousness and performance pressure, making physical engagement feel more accessible and enjoyable, particularly for students who may feel uncomfortable in competitive or highly structured physical activities.

Another important factor is the relationship between movement and emotion. Physical activity outdoors often supports emotional regulation by providing a natural outlet for tension and restlessness. The body can release stress through movement without the need for verbal expression or conscious processing. At the same time, natural settings tend to evoke feelings of calm, curiosity or awe, which can broaden emotional perspective and reduce rumination.

For young people experiencing stress or mental overload, this combination of movement and emotional softening can be particularly beneficial.

Natural environments also encourage self-paced activity. Unlike indoor settings, which are often governed by schedules, rules and fixed timeframes, outdoor movement allows for variation in speed, intensity and duration. Adolescents can learn to listen to bodily signals, adjusting effort based on energy levels, weather or terrain. This fosters a more attuned relationship with the body and supports self-regulation skills that are essential for long-term wellbeing.

The difference between outdoor and indoor physical activity is also social. Outdoors, movement tends to be more cooperative and less hierarchical. Group activities such as walking, exploring or building together encourage side-by-side interaction rather than direct competition. Conversation flows more naturally when bodies are in motion, and silence is often more comfortable. These conditions support social connection without pressure, reinforcing wellbeing through shared experience rather than performance.

Importantly, natural environments invite a sense of meaning that artificial settings often lack. Movement outdoors connects the body to place, season and environment. Students experience weather, light and landscape as part of their activity, reminding them that they are embedded in a larger system. This embodied connection can foster a sense of grounding and perspective, helping young people step outside narrow concerns and reconnect with broader rhythms of life.

In educational contexts, these differences have practical implications. When physical activity is integrated into outdoor learning, it supports wellbeing not only through movement itself, but through the quality of experience that movement provides. Attention improves, stress decreases, and students often return to learning tasks with greater clarity and openness. This is particularly relevant in sustainability education, where engagement requires emotional balance, reflection and the ability to tolerate complexity.

Understanding why physical activity in nature has a distinct impact on wellbeing helps educators make more intentional choices. Outdoor learning is not simply a change of location, but a shift in how the body, mind and environment interact. By recognising and valuing this interaction, teachers can design learning experiences that support health, balance and sustainable engagement with both learning and life.

Chart below comparatively summarises the advantages of outdoor activity versus the time spent indoor.

Dimension	Indoor / Artificial Settings	Natural Outdoor Environments	Impact on Wellbeing
Sensory experience	Limited, repetitive stimuli (flat surfaces, artificial light, constant temperature, predictable sounds)	Rich, varied stimuli (uneven ground, natural light, wind, changing sounds, textures, weather)	Activates coordination and bodily awareness without effort; reduces sensory overload
Nervous system response	Often stimulating or stressful; prolonged alertness	Calming and regulating; supports balance between activation and relaxation	Lower heart rate, reduced blood pressure, decreased muscle tension
Attention	Requires sustained, directed focus; mentally demanding	Supports soft, effortless attention	Reduces mental fatigue; restores focus and clarity

Relationship to effort	Often performance-oriented, measured or competitive	Purposeful, self-paced, non-competitive	Movement feels accessible and enjoyable; less pressure and self-consciousness
Emotional regulation	Limited outlets for stress release	Movement combined with calming environments	Releases tension naturally; supports emotional balance
Pace and rhythm	Fixed schedules, uniform intensity	Variable pace shaped by terrain, weather, energy levels	Encourages listening to bodily signals and self-regulation
Social interaction	Often structured, hierarchical, performance-based	Side-by-side, cooperative, informal	Strengthens connection without pressure; supports belonging
Sense of meaning	Abstract, task-focused	Embedded in place, season and environment	Fosters grounding, perspective and connection to life systems
Learning readiness	Can increase fatigue and disengagement	Enhances openness and engagement	Improves readiness to learn and reflect
Sustainability connection	Often theoretical or cognitive	Lived, embodied, experiential	Sustainability becomes felt and meaningful, not abstract

Chapter 3: Personal growth through challenge, rhythm and self-regulation

In educational contexts, personal growth is often associated with achievement, progress and measurable outcomes. Students are encouraged to improve performance, reach targets and demonstrate competence, frequently through comparison with others. While such approaches have their place, they can also create pressure, anxiety and disengagement, particularly for young people who struggle to meet external expectations. Outdoor learning offers a different pathway to personal growth, one that is grounded in experience, rhythm and self-regulation rather than competition or performance.

Outdoor activities introduce young people to forms of challenge that are real but not artificial. Weather changes, uneven terrain, distance, time and uncertainty all require adaptation. These challenges are not imposed to test ability, but arise naturally from the environment itself. As a result, students learn to respond rather than perform. They adjust their pace, manage effort, and make decisions based on how they feel physically and mentally in the moment. This process supports the development of self-awareness and resilience, as students learn to recognise limits and respond to them constructively.

A key element of personal growth in outdoor learning is rhythm. Natural environments operate according to cycles and variation rather than constant intensity. Walking alternates with resting, effort with recovery, attention with reflection. When students spend time outdoors, they are exposed to these rhythms and invited to align their own energy levels with them. This contrasts sharply with many indoor learning environments, where sustained concentration and constant productivity are expected regardless of fatigue or emotional state.

Through outdoor activities, students begin to experience self-regulation as a practical skill rather than an abstract concept. They learn when to slow down, when to pause, and when to continue. For example, during a longer walk or outdoor task, a student may notice physical tiredness or mental overload and adjust their pace accordingly. Over time, these experiences strengthen the ability to manage energy, emotions and attention, which are essential for wellbeing both inside and outside school.

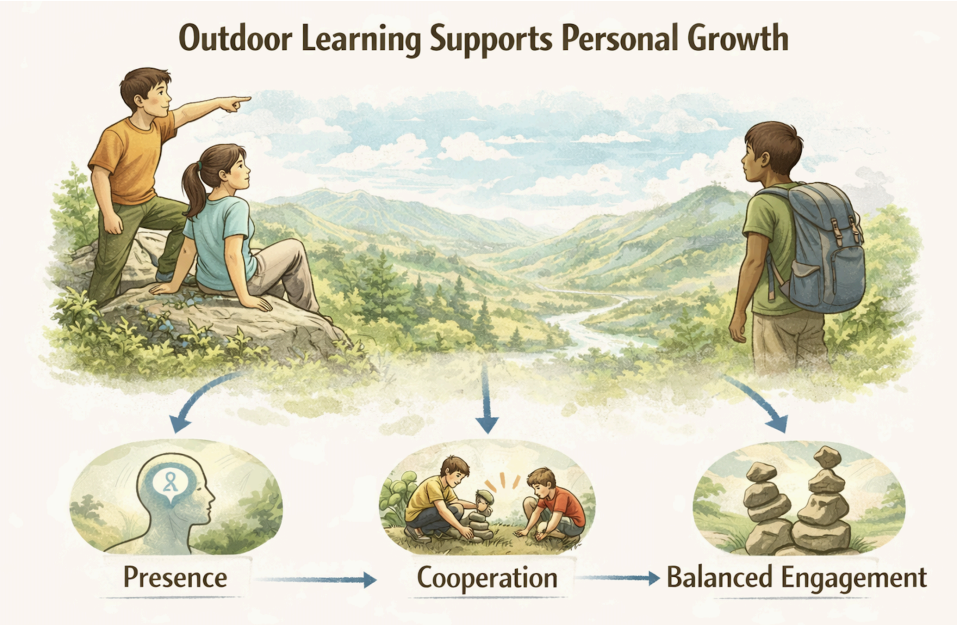
Importantly, outdoor challenges tend to be inclusive because they do not rely on predefined standards of success. There is no single correct way to walk a path, observe a landscape or participate in a group task. Each student engages from their own starting point. This reduces comparison and creates space for personal growth that is internally motivated rather than externally judged. Students who may feel insecure in competitive environments often find greater confidence when challenges are framed as shared experiences rather than tests.

Resilience develops gradually through repeated exposure to manageable difficulty. Outdoor learning supports this process by offering challenges that are meaningful but not overwhelming. Facing changing weather, navigating unfamiliar spaces or sustaining effort over time teaches students that discomfort does not necessarily signal failure. Instead, it becomes part of learning how to cope, adapt and continue. These experiences help build tolerance for uncertainty and persistence, qualities that are increasingly important in a rapidly changing world.

Reflection plays a central role in transforming outdoor experience into personal growth. Moments of quiet observation, guided discussion or individual journaling allow students to connect physical experience with emotional insight. Questions such as “How did my body feel during this activity?” or “What helped me continue when it became difficult?” encourage students to articulate internal processes that are often overlooked in traditional education. This reflective practice strengthens self-understanding and supports the transfer of learning to other areas of life.

Another important aspect of outdoor learning is the absence of constant evaluation. Without grades, rankings or performance metrics, students are free to focus on experience rather than outcome. This fosters intrinsic motivation and a sense of agency. Students learn to trust their own judgement, listen to their bodies and make decisions based on wellbeing rather than external approval. Such autonomy is a cornerstone of personal growth and long-term resilience.

Outdoor activities also highlight the interconnectedness between self-regulation and sustainability. Learning to pace oneself, respect limits and value balance mirrors the principles of sustainable living. Just as ecosystems require equilibrium to thrive, individuals need balance between effort and rest. By experiencing these principles physically, students gain insight into sustainability as a lived practice rather than an abstract ideal.



In this way, outdoor learning supports personal growth by shifting the focus from performance to presence, from competition to cooperation, and from constant output to balanced engagement. Through challenge, rhythm and self-regulation, young people develop resilience, self-awareness and confidence grounded in experience. These qualities form a strong foundation for wellbeing and prepare students to engage with learning, relationships and sustainability in a more balanced and sustainable way.

PART II – PRACTICAL EXAMPLES FROM AROUND THE WORLD

While theory helps explain the relationship between movement, wellbeing and sustainability, it is through lived experience that these connections become tangible and meaningful. Across different countries and educational contexts, teachers, schools and community organisations have developed practical ways to use outdoor and nature-based activities to support young people's physical vitality, mental balance and personal growth. These initiatives show how learning can be reconnected with the body, rhythm and everyday experience, offering students opportunities to move, reflect and engage with sustainability in ways that support wellbeing rather than overwhelm.

The examples presented in this section illustrate how outdoor learning can be used to restore balance in increasingly sedentary and digitally dominated lives. They demonstrate how physical activity in natural environments supports attention, emotional regulation and resilience, while also strengthening students' connection to place and environment. From simple wellbeing walks and movement-based learning routines to longer outdoor programmes focused on challenge, reflection and recovery, these practices highlight the role of nature as a supportive context for sustainable learning and healthy development.

The case studies included here are not intended as fixed models to be replicated. Instead, they are offered as sources of inspiration and reflection. Each example shows how educators have adapted outdoor learning to their local conditions, working with available spaces, cultural traditions and everyday school realities. Together, they demonstrate that wellbeing-centred outdoor education can take many forms, from short, low-intensity activities integrated into the school day to more immersive experiences beyond the classroom. By exploring these practices, teachers are invited to reflect on their own context and consider how similar principles might be applied to support students' wellbeing, personal growth and sustainable engagement with learning.

Finland

In Finland, nature-based youth workshops have been developed as a structured response to growing concerns about young people's wellbeing in increasingly sedentary and digitally dominated lives. These initiatives, studied within the context of youth work and education, were designed for young people who were outside formal education or employment, but their structure and methods offer valuable insights for school contexts as well. The workshops intentionally used natural environments as everyday learning and activity spaces, recognising that regular movement, routine and contact with nature can support both physical and mental balance (research on Finnish nature-based interventions, 2023).

The activities implemented within these workshops were carefully planned to combine physical movement, meaningful engagement and social connection without creating pressure or competition. One of the central elements was regular guided walks and hikes in nearby natural environments such as forests, lakesides or parks. These walks were not designed as fitness challenges, but as opportunities for gentle, sustained movement and sensory engagement. Participants were encouraged to walk at a comfortable pace, notice their surroundings and remain attentive to bodily signals such as fatigue, tension or relaxation. This approach helped reduce stress responses and supported emotional regulation through rhythm and presence rather than exertion (Finnish youth wellbeing studies, 2023).

Alongside walking activities, participants engaged in practical, nature-related tasks that provided a sense of purpose and contribution. These included gardening, simple conservation activities, caring for green spaces and basic ecological work. Such tasks allowed young people to use their bodies in meaningful ways while seeing tangible results of their actions. Engaging physically with nature in this way helped counter feelings of passivity and disengagement often associated with prolonged screen use and inactivity, while also strengthening connection to local environments (nature-based youth workshop evaluations, 2023).

The workshops also included skill-building activities related to outdoor life and environmental understanding. Participants learned to identify local plants and wildlife, use simple outdoor tools and understand basic ecological relationships. Learning took place through observation and hands-on experience rather than formal instruction, reinforcing confidence and competence through doing. These activities supported personal growth by allowing young people to discover abilities they were often unaware of, particularly those who had struggled in more traditional learning environments (Finnish applied environmental education research, 2023).

Equally important were the reflective and social components of the programme. Group discussions and informal reflection sessions were regularly held outdoors, often after shared activities. Participants were invited to talk about how they felt during the activities, what they noticed about themselves and how time spent outdoors affected their mood and energy. Being outdoors created a calmer, less formal atmosphere that made sharing easier and strengthened peer relationships. These moments of reflection supported emotional awareness and helped participants connect physical experience with mental wellbeing (qualitative findings from Finnish youth workshops, 2023).

Routine and predictability were deliberately built into the programme structure. Activities took place regularly, often at the same times and in similar settings, creating a rhythm that supported stability and a sense of belonging. For young people whose daily lives lacked structure, this regular engagement with nature offered grounding and continuity. Over time, participants reported increased motivation, improved mood and a stronger sense of connection to both people and place (longitudinal observations in Finnish youth interventions, 2023).

This Finnish example demonstrates how outdoor learning can be used to restore balance in lives shaped by inactivity and digital overload. By combining movement, meaningful activity, reflection and routine in natural environments, these workshops supported wellbeing without relying on performance, competition or technology. The approach offers transferable principles for schools and educational settings seeking to reconnect young people with their bodies, rhythms and the natural world in supportive and sustainable ways.

EU level

The Wellbeing in Nature course is an Erasmus+ funded professional development programme designed to support educators in integrating nature-based wellbeing practices into school life. The course has been implemented in several European countries and cities, including Spain, Portugal, Slovenia, Croatia, Denmark and Italy, allowing participants to experience outdoor learning in diverse cultural and environmental contexts. These varied locations demonstrate that nature-based wellbeing practices can be adapted to different climates, landscapes and school realities, from urban parks and botanical gardens to coastal and semi-natural environments.

The course typically takes place over one week and places direct experience at the centre of learning. Rather than focusing primarily on theory, participants spend a significant portion of the programme outdoors, engaging in activities designed to support mental balance, physical

awareness and reflection. These include guided mindfulness walks in parks and natural areas, sensory awareness exercises that encourage attention to sound, light and movement, and quiet observation practices that help participants experience how natural environments influence stress levels and focus. Through these activities, teachers are invited to reflect on their own wellbeing and recognise the restorative effects of nature first-hand (School Education Gateway, year).

Alongside experiential learning, the course includes practical workshops that support the transfer of these methods into everyday school practice. Educators work together to explore how nature-based activities can be integrated into lessons, breaks and wider school routines. Examples include short outdoor reflection moments at the beginning or end of the school day, movement-based learning activities in green spaces, and simple wellbeing practices that can be carried out in schoolyards or nearby parks. Participants are encouraged to adapt activities to their own contexts, considering available spaces, time constraints and the needs of their students (Teacher Academy course materials, year).

Facilitators of the course typically have backgrounds in outdoor education, experiential learning and wellbeing pedagogy. They support participants in connecting personal experience with pedagogical reflection, helping teachers identify how nature-based wellbeing practices can support concentration, emotional regulation and social interaction among students. Discussions often include how these practices can reduce stress related to academic pressure and digital overload, while also supporting inclusive learning environments that benefit all students (European teacher training reports, year).

Slovenia

The *Resilience for Children with Outdoor Pedagogics* course in Slovenia is an Erasmus+ professional development programme that explores how nature-based pedagogical methods can support emotional development and resilience in children. The course is held in natural settings where educators spend most of their time outdoors, engaging directly with the environment and with each other. Instead of traditional classroom lectures, sessions are structured around guided activities in forests, meadows and other natural landscapes, giving participants a chance to experience nature as both a physical environment and a pedagogical space.

Throughout the course, participants work with the concept of *nine pillars of resilience*, which include emotional balance, social connection, presence, flexibility, self-awareness, patience, cooperation, creativity and a sense of purpose. These pillars are explored through a series of outdoor exercises designed to help teachers recognise how natural settings can support emotional regulation and personal strength in young people. For example, mindful walking exercises help participants become more attuned to their breathing and bodily sensations, while reflective storytelling sessions around natural landmarks encourage emotional expression and listening skills.

Group activities are woven into the fabric of the course to deepen social connection and collaborative problem-solving. Educators might work together to build simple shelters, navigate short nature paths in pairs, or create small group sculptures from natural materials. In each of these activities, emphasis is placed not on performance or achievement, but on cooperation, shared experience, and respectful interaction with the environment and with peers. Through these exercises, teachers learn how to *prompt reflection in students, help them recognise their emotional reactions, and practice adaptability when plans change* — all of which are key aspects of resilience.

Facilitators also lead discussions about how outdoor pedagogic methods can be adapted to different school settings. Educators share ideas about how regular nature-based sessions can be incorporated into school routines, from weekly outdoor classes in nearby parks to

project-based learning that requires students to observe seasonal changes or maintain school gardens. The course encourages teachers to think beyond occasional field trips and to reimagine outdoor learning as a continuous, intentionally designed part of the educational experience that supports children's emotional wellbeing as much as their academic growth.
Participants frequently report that the experiential nature of the course, spending sustained time in natural settings, reflecting on their own responses to these environments, and practising activities that promote resilience, helps them see how nature can be a resource for emotional learning. Teachers return to their schools with *practical strategies for guiding children through nature-based activities that build self-control, social skills, and a respectful relationship with the natural world*, recognising that these capacities are essential for coping with stress and uncertainty in everyday life (course descriptions and participant reflections).

PART III – LESSON PLANS & USEFUL ACTIVITIES

Lesson Plan 1

The Detective's Trail (Hunting for Stories in the Snow)

- **Theme:** sustainability, empathy, and belonging
- **Subject:** Environmental Studies / Natural Science, Biology, Foreign Language, Ethics, Homeroom, Language and Literature
- **Age group:** 10–18 years
- **Duration:** 60 minutes (outdoors) + 30 minutes (follow-up reflection)
- **Location:** any snowy outdoor space (schoolyard, park, or forest)
- **Language of instruction:** flexible - mother tongue or target foreign language
- **Linguistic level:** adaptable (A1–C1). Focus on descriptive vocabulary, animal-related vocabulary, and language for telling a story (narrative).

The Detective's Trail is a 90-minute nature-based lesson (60 min outdoors, 30 min indoors) designed for students aged 10–18. It transforms a snowy landscape into a narrative canvas, teaching students that even a bird's claw mark or a slushy boot print has a story worth telling. By documenting these temporary tracks, students shift from passive observers to active investigators of their environment.

Learning Objectives

Overview: By documenting the tracks, students create a permanent memory of a temporary moment. This teaches them that even the smallest details in nature, a bird's claw mark or a slushy boot print, have a story worth telling. It shifts the students from being passive observers to active investigators of their own environment. This is the heart of sustainability: noticing, valuing, and protecting the small things.

- **Environmental literacy:** identifying that we share space with diverse species (biodiversity)
- **Empathy & perspective-taking:** "walking in the shoes" (or paws) of another
- **Mindfulness:** developing "active eyes" to find beauty in small, often overlooked details.
- **Social connection:** building a shared narrative through group investigation
- **Narrative competence:** using visual clues to build a logical and empathetic story.
- **Eco-systemic awareness:** realizing that the schoolyard is a shared habitat, not just a human space.
- **Emotional resilience:** using the "mystery" of nature to spark joy and wonder, which acts as an antidote to stress.
- **Accountability:** connecting the physical "mark" in the snow to the concept of a "carbon footprint."

Phase 1: The Outdoor Hunt

Activity 1. The "silent arrival" and grounding

Begin in a circle. Ask students to close their eyes and listen to the "sound of the snow."

- **Goal:** To lower stress levels and sharpen the senses before the hunt begins.

Activity 2. The scavenger hunt: "Who was here?" (30 min)

Divide students into small teams (3–4 people). Their mission is to "hunt" and photograph at least four different types of tracks. Remind students to walk *beside* tracks, not *on* them, to preserve the "story" for others.

Suggested “hunt list”:

- A "Lonely trail/ Lonely footprint" (one set of tracks heading away)
- A "Meeting point" (where two or more tracks cross—e.g. several people, a dog and owner, or two birds)
- A "Mystery track" (something they can’t immediately identify).
- A "Struggling track" (muddy, slushy, or deep tracks showing heavy movement)

Teacher’s Note: Ask students to try to identify the "maker" of the tracks (they can use the internet to do this). “Do you see claw/paw marks? Is the track symmetrical? How deep is the impression?"
Encourage students to look for the tiny stories. “Did the bird hop or fly? Was the dog running or walking?” This builds critical thinking and curiosity.

Activity 3. The "circle musing"

Gather the group around a particularly interesting set of tracks (e.g., a deer trail, the footprints of a squirrel running up a tree, or a messy patch of slushy human prints).

On-site discussion:

- "Look at these tracks: how was this creature feeling? Were they in a hurry? Were they cold? Where were they heading? Were they looking for food?"
- "Where do these tracks meet others? Did they play, fight, or just pass by?"
- "How does it feel to know that while we were inside, this whole secret life was happening out here?"

Activity 4. Impersonation (Perspective-taking)

Theme: "Walking in another's tracks."
Objective: To develop empathy and narrative skills by shifting from a human-centered view to an eco-centered view.

In this phase, students move from being "detectives" (observers) to "protagonists" (participants). They use the physical clues found in Activity 2 and 3 to build a first-person narrative.

Linguistic Note: This activity is excellent for f**oreign language practice**. It encourages the use of the “first person" (I am, I feel, I go) and descriptive "sense" verbs.

Implementation options

Option A: The solo storyteller (Best for confident groups)

One student stands at the start of a trail and "becomes" the creature. They may walk slowly along the tracks as they speak, or they may simply stand over the footprints.

> *Example:* "I am a fox. The snow is deep and my belly is empty. I smell something near that trash can..."
>
> **Benefit:** Creates a focused moment that the whole group can observe.

Option B: The collaborative weaving (Best for inclusion and teamwork)

The group stands around a track, and each student adds one sentence to the story, continuing from the person before them.

> *Example:*
> - Student 1: "I am a small sparrow and I just landed here."
> - Student 2: "I feel the wind under my feathers, it is very cold."
> - Student 3: "I see a crumb of bread near a student's boot print..."
>
> **Benefit:** Less pressure on individual students; encourages active listening and cooperation.

Instructions for students

- **Select your track:** Choose one of the stories you "hunted" earlier.
- **Sensory check:** Before you speak, close your eyes for 10 seconds. Imagine your feet are paws or talons. Imagine you are closer to the cold ground.
- **The first-rerson rule:** You must only use "I." Do not say "The bird felt..."; say **"I felt..."**
- **Try to answer:**
    - *Where did I come from?*
    - *What am I looking for?*
    - *What do I think of these big human footprints I just crossed?*
    - *How does the world look through my eyes?*

Activity 5. My footprint (Sustainability)

Look at your own boots. Stand still for 30 seconds, then step back. Take a photo of your footprints.

- **Reflection:**
    - Is your footprint deeper or shallower than the animal tracks?
    - How long will your footprint last before the wind or more snow covers it? Does the fact that it is temporary make it more or less important?
- **The metaphor:**
    - In the school community, what kind of "footprint" do you want to leave today? (e.g., *a footprint of kindness, a footprint of help, a footprint of silence*)
    - If your footprint is muddy or messy, it shows you've struggled with the terrain. In our classroom 'environment,' how do we react when someone leaves a 'messy' footprint because they are having a hard day?
    - Look back at the trail you made coming here. If someone followed your 'life-trail' based only on your actions this week, where would they think you are heading?
    - If the snow represents a 'clean slate' or a fresh start, what is one habit you want to leave behind in the old snow, and what is one new 'print' you want to make?

Activity 6. Follow-up questions for reflection

Teacher's Note: Please allow for "thinking silence." In nature-based learning, sometimes the most profound reflection happens in the 30 seconds of quiet after a question is asked. This is a form of emotional regulation: teaching students to be comfortable with stillness and deep thought.

1. Questions on "belonging/shared space"

- "If this park is a 'shared home,' who are the most important residents? Are we the owners or the guests?"
- "We saw tracks crossing each other. In what other ways are our lives connected to these animals, even when we don't see them?"
- "How does it feel to realize that you are never truly 'alone' when you are outside in nature?"

2. Questions on "empathy and perspective"

- "When you were 'standing in the paws' of the animal, did the cold feel like an enemy or just a part of life?"
- "If these animals could leave a 'message' for us in the snow, what do you think they would want to say about how we treat this space?"
- "How did it change your mood to look at the world from a much lower (or higher) height than usual?"

3. Questions on "sustainability and impact"

- "We can see our footprints in the snow very clearly today. What are some 'invisible footprints' we leave on nature that we can't see as easily?"
- "The snow will melt and these tracks will vanish. What parts of our experience today will 'stay' with you even after the snow is gone?"
- "Knowing that a bird or a fox might sleep right where we are standing, does that change how you might behave here tomorrow?"

4. Questions on "personal growth and wellbeing"

- “Now that you have told the story of this creature, does this patch of snow look different to you? Is it just 'snow,' or is it a 'home'?”
- “At the start, we walked in silence. Was the silence 'empty,' or was it full of sounds and stories you hadn't noticed before?”
- “Did focusing on a small footprint help you forget about any stresses or worries you had before we came outside?”
- “What is one thing the 'creature' you impersonated could teach humans about being resilient or patient?”

Phase 2: The Interior Reflection (30 min)

This can happen immediately after coming inside over a hot tea, or in the next lesson using the photos taken. It can also be set as homework.

1. Micro-story (perspective-taking)

Using the photos (clear ones, muddy ones, trails), students choose one image and write a "micro-story" (3-4 sentences) from the perspective of the track-maker. It could even become a short poem.

- *Example (bird tracks):* "I woke up and the world was white. My toes are cold, but I see a red berry in the distance. I hop carefully."

2. Deep reflection: The footprints we leave

Encouraging students to think metaphorically about snowy footprints.

- *The muddy vs. the clear:* Discuss how the "muddy/slushy" prints represent our "heavy" impact on the world (waste, pollution), while the "light" prints represent a sustainable life.
- *Belonging:* "We saw tracks of birds, deer, cats, and humans. Do we all belong to this park? If so, how should we treat our 'roommates' in nature?" “Did we intrude their living space or did they visit our living environment?”

● Creative writing: The message from 2046

This task is a self-reflection and vision-building exercise. It uses the physical footprint left in the snow as a metaphor for the student’s life path and long-term impact.

- **Who is writing?** The students are writing as their **Future Self** (20 years from now).

- **To whom?** The students are writing to their **Current Self** (the student standing in the snow today).
- **The trigger:** their future self has just found a photo of their 2026 footprint in a digital archive.

The Task

Imagine it is the year 2046. You are looking at the photo you took today of your footprint in the snow. Write a letter from your **Future Self** back to your **Current Self**. Use the photo as your starting point:

"Dear Younger Me,

I have just found this photo of your footprint from the winter of 2026. Looking at that single mark in the snow, I want to remind you of what you still believed in back then...

Today, 20 years later, that 'footprint' has grown into the life I am living now. People here remember you for... "

In your letter, address these points:

- Based on the tracks you left at school this week, what kind of "life-trail" were you starting to build?
- Was your footprint "light and clear" (sustainable and kind), or was it "heavy and muddy" because you were struggling with the terrain?
- If the snow today was a "clean slate," what is the one habit your Future Self is glad you left behind in the "old snow"?

● Creative writing: A day in the life of…

Aim: Students practice empathy and narrative perspective by "becoming" the animal or person who left the tracks. It transforms a scientific observation into emotional intelligence. By narrating a struggle for survival or a moment of play in the cold, students process their own feelings of resilience and belonging.

Teacher displays the photos taken during the outdoor hunt (squirrel, dog/owner, deer, cat, bird, mystery track, slushy footprints, heavy boots, etc.). Students have to choose the photo that they feel the strongest connection to. They write a short story based on these rules:

Perspective: Write only as **"I"** (e.g., *"I am the squirrel..."*).
The goal: What is your protagonist searching for? (Food, warmth, a lost friend?)
The obstacle: How does the deep snow or the cold wind make their journey difficult?
The encounter: Describe the moment you cross another set of tracks. How do you feel about the "stranger" who was there before you?
Students read their stories in small groups. Reflection Question: "Did writing as this creature change how you feel about the 'living space' we shared today?"

Post-Lesson Reflection for Teachers

This section is designed to help you evaluate the pedagogical success of the snow-based activities and your role as a facilitator.

Teacher's Note: In nature-based learning, the most profound reflections often happen in moments of stillness. Allow yourself the same "thinking silence" you gave your students.

1. Reflecting on students and the snowy environment

- **Observation vs. action:** How did students handle the challenge of "just observing" the tracks without immediately trying to "fix" or alter them?
- **The power of perspective:** Which "non-human" perspective (e.g., the bird or the fox) led to the most surprising or creative sustainability ideas?
- **Emotional connection:** Did focusing on a single, small footprint help stressed or anxious students forget their worries and find "wonder" in the mystery of nature?
- **Shared habitat:** Did the students' comments suggest they now see the snowy park/forest as a "shared home" rather than just a human space?

2. Reflecting on pedagogical performance

- **Managing the "thinking silence":** Did I allow for at least 30 seconds of quiet after asking deep questions about the tracks to allow for emotional regulation?
- **Facilitating empathy:** How effectively did I enforce the "first-person rule" (using "I" instead of "the bird") to ensure a deep empathetic shift?
- **Preparing the narrative:** Did the "sensory check" (eyes closed, feet as paws) effectively prepare students for the impersonation task?
- **The transition:** How successfully did I bridge the gap between a physical boot print in the snow and the abstract concept of a life-trail or carbon footprint?

3. Reflecting on personal growth and impact

- **Shift in perception:** How has my own view of this "patch of snow" changed after hearing the stories my students created?
- **The value of the temporary:** Did the realization that the tracks will melt change the way I (or the students) valued the importance of the activity?
- **The "clean slate":** If the snow represents a fresh start, what is one habit I want to "leave behind in the old snow" regarding my teaching style?

LESSON PLAN 2

Treasures Beneath Our Feet and Above Our Heads

Theme: Healing plants and nature-based stress reduction

Subject: Biology, Natural Science

Target age group: upper secondary (ages 14–18)

Duration: 2 x 45 minutes

Timing: Best conducted in spring (April–May) during the flowering season.

Setting:

- **Outdoor:** schoolyard, nearby park, or riverbank for sensory exploration and collection
- **Indoor:** classroom for processing materials and reflection

Adaptability:

- Can be adapted for upper elementary and lower secondary by simplifying botanical terminology and focus.
- Can also be adapted internationally. The pedagogical framework (the "how") remains the same, but the botanical content (the "what") is flexible.
- Can be conducted in any language.

Learning objectives:

- **Sustainability awareness:** Students understand the ecological role of "weeds" and their importance in biodiversity.
    - Practice sustainable harvesting—collecting only what is necessary for use.
    - Recognize the value of local, shared green spaces as "natural pharmacies".

- **Social-emotional learning (SEL) and wellbeing:**
    - Mental deceleration through sensory exercises (sight, sound, smell, touch).
    - Stress reduction by reconnecting with the calming effects of nature.
    - Perspective-taking through shared memories and personal connections to nature.

- **Social inclusion:** Diverse entry points through group work (collecting, photographing, identifying, or preparing).
    - Valuing local knowledge and family traditions (e.g., "grandmother's tea"). (Local knowledge: traditional remedies and nature-based observations passed down through families or the local community.)

Transversal skills development:

- **Observation:** Developing keen senses to identify specific plant traits (e.g., leaf shape, scent, texture).
- **Critical thinking:** Challenging the "useless weed" stereotype and understanding plants as part of a complex living system.
- **Communication and collaboration:** Working in teams to find "treasures," share findings, and prepare herbal products together.
- **Creative problem-solving:** Using digital tools and research to transform raw natural materials into practical remedies or food.

Key competences developed:

- **Environmental citizenship:** Developing a sense of responsibility for local flora and recognizing nature as a resource for health.
- **Empathy and social awareness:** Strengthening group cohesion through shared sensory and emotional experiences.
- **Systems thinking:** Understanding how humans, insects (like butterflies), and plants (like nettles) interact within a local ecosystem.

Materials (low-cost and inclusive):

- **Field kits:** Research cards with photos, collection bags/baskets, and gardening gloves.
- **Digital tools:** Smartphones for macro photography and plant identification apps (e.g., PlantNet).
- **Processing tools:** Electric kettles, heat-resistant jars, cutting boards, and basic salad ingredients.
- **Personal items:** Students bring their own mugs to promote sustainability and reduce waste.

Summary

"Treasures Beneath Our Feet and Above Our Heads" aims to transform "invisible" weeds into valuable ecological treasures, fostering mental wellbeing and sustainability through direct contact with local nature.

Students engage in a two-part journey from outdoor sensory discovery to indoor culinary application. Initially, they practice "deceleration" in a park or schoolyard, using observation and digital apps to identify healing plants like nettle and linden. By engaging their senses, they reduce academic stress and build an emotional connection to their environment. In the second phase, students collaborate in a "Tea House" or "Salad Bar" setting, applying biological and chemical knowledge to process their finds into teas and salads. This transition from observation to agency develops transversal skills while teaching students to view the local ecosystem as a vital, shared resource for health and resilience.

ACTIVITIES

Lesson 1: The Discovery (Outdoors – 45 minutes)

Focus: Sensory experience, stress reduction, observation, teamwork.
Objective: Sensory experience, plant identification, and mental deceleration.

Required Materials:

- **Research cards:** Laminated sheets with photos and identification features of seven targeted plants (Nettle, Dandelion, Plantain, Linden, Acacia, Chickweed, Shepherd's Purse) – 1 set per team.
- **Collection containers/bags:** Paper bags or baskets for collecting plant samples.
- **Protective gear:** Gardening gloves (especially for nettles) and pruning shears.
- **Digital devices:** Smartphones for photos and plant identification apps (e.g., PlantNet).

- **Writing materials:** Notebooks and pens to record observations.
- **First Aid Kit:** Allergy medication, disinfectant, bandages.

I. Attunement (10 minutes)

Objective: Releasing classroom stress, arriving in nature (Well-being).
Practice: Ask students to silence their phones.

- **Sensory circle:** Stand in a circle. Have students close their eyes for 1 minute.
- **What do you hear?** Examples: birds, wind, distant cars
- **What do you smell?** Examples: damp earth, floral scents
- **What do you feel on your skin?** Example: sunlight, breeze, insects

Teacher's narration: "Nature is not just a backdrop, but a living system we are part of. Today, we are looking for things we pass by every day and call 'weeds,' even though they are treasures".

II. Group treasure hunt – "Treasures from the meadow to the canopy" (25 minutes)

Objective: Cooperation, critical thinking, plant knowledge.

- Form 7 teams of 3–4 students each. Give each team a set of research cards. These cards contain images and short descriptions of the plants they need to find in the area.

- **Target list (easily recognisable species):**
    - **Common Nettle:** The "stinging enemy" that is actually a superfood and blood purifier.
    - **Dandelion:** The "curse" of gardens, but its leaves are for salad, roots for coffee substitute, and flowers for honey.
    - **Ribwort Plantain:** The "roadside bandage".
    - **Small-leaved Linden:** Fragrant blossoms, calming effect.
    - **Black Locust (Acacia):** Fragrant blossoms, calming effect.
    - **Chickweed:** A soft carpet on the ground - a vitamin-rich salad base.
    - **Shepherd's Purse:** Heart-shaped pods - blood-staunching power.

- **Task:** Identify the plants, collect small samples (only as much as needed for the 2nd hour – sustainability principle), and take a macro photo.

III. Closing circle under the tree (10 minutes)

Objective: Emotional intelligence, nostalgia. Sit in the grass or under a large tree (e.g., Linden).
Question: "Smell the collected plants or the tree's flowers. What memories do you associate with this scent?".
Sharing: Allow them to recall grandmother's tea, summer breaks, or times when someone cared for them while they were sick. This strengthens group cohesion and a sense of security.

Lesson 2: Tea House and Salad Bar (Classroom work - 45 minutes)

Focus: Chemical/biological background, creation, peace of mind.
Objective: Processing collected materials, chemical connections, and community experience.

Materials:

- **Collected samples:** Fresh plants on the tables.
- **Tea making kit:** Electric kettles, 5 heat-resistant glass pitchers, filters, and personal mugs for every student (sustainability: no plastic cups!).
- **Lab equipment:** Magnifying glasses for examining plant parts (e.g., nettle hairs).
- **Gas Gastro-accessories:**
  - Cutting boards and knives for the salad, bowls for washing and serving, small plates and cutlery for tasting.
  - Honey, lemon, dried ribwort plantain, dried linden blossom, dried black locust (acacia) blossom, dried shepherd's purse for the teas.
  - Olive oil, vinegar, white pepper, salt, dill, fresh dandelion leaves, fresh chickweed; one bunch of garden radishes (sliced into half-moons), 1–2 spring onions (sliced into rings), 4–5 dkg cubed Trappist cheese (or similar mild semi-hard cheese), lemon juice, and balsamic vinegar for the salads.
- **Visuals:** Projector for displaying photos taken outdoors.

I. Nature's pharmacy (15 minutes)

Objective: Breaking the "useless weed" stereotype, gaining professional knowledge.
Task: Spread the collected plants out on the tables. Discuss as a class: What do we call a weed? What is their ecological role?

- **What do we call a weed?** In everyday terms: it grows where we do not want it. **Biological definition:** Plants with broad tolerance in several respects, preferring disturbed or degraded habitats, having short growing seasons, fast development, and often being invasive. They primarily grow in cultivated or disturbed areas and cannot survive in natural biological communities. (Source: OH-BIO1112E textbook; Educational Authority, 2021)

- **What is their ecological role?** Weeds also play a role in maintaining biodiversity. (For example, nettle is a host plant for the caterpillars of many butterflies, such as the European Peacock; in disturbed areas, it helps with soil binding and natural regeneration.)

Task: The collected plants are also medicinal herbs. Students should learn about their healing properties. Each team should draw an information card featuring one of the seven collected plants. Using the information on the card, the team should discuss the characteristics of the given plant and its potential uses as a medicinal herb. One member of each team should briefly present these medicinal uses to the rest of the class. Meanwhile, project the photos taken of the plants using a projector.

II. Creative workshop (Group work - 20 minutes)

Objective: Creativity, problem-solving, hands-on experience.
Task: Teams choose a project to prepare a tea or salad from their fresh or dried samples using phone-researched recipes.

- **“Drink of the Brave”** – preparing tea from fresh Nettle leaves.
- **“Spring Energy”** – preparing salad from fresh Dandelion leaves.
- **“Guardian of the Throat”** – preparing tea from Ribwort Plantain.
- **“Honey Embrace”** – preparing tea from Linden blossom.
- **“Fairy Nectar”** – preparing tea from white Acacia (Black Locust) blossom.
- **“Emerald Salad”** – preparing salad from fresh Chickweed.
- **“Drink of Green Hearts”** – preparing tea from Shepherd's Purse.

III. Shared tea and salad tasting (Reflection and closing - 10 minutes)

Objective: Stress reduction, community experience, gratitude.
Ritual: Everyone receives a small glass of tea and/or a plate of salad.
Soft skill practice: While eating/drinking, everyone shares one thing they "noticed" for the first time today (a plant detail, a classmate’s thought, or the silence under the tree).
Message: “In nature, the cure and the calm are free; you just have to notice them. If you are stressed, go out among the trees for 10 minutes”.

Post-Lesson Reflection

This section is designed to help you evaluate the pedagogical success of the plant-based activities and your role as a facilitator in reconnecting students with the "hidden" natural world.
Teacher’s Note: In nature-based learning, the most profound reflections often happen in moments of stillness. Allow yourself the same "thinking silence" you gave your students during their sensory attunement.

1. Reflecting on students and the natural environment

- **Observation vs. utility:** How did students handle the challenge of viewing a “weed” (like nettle or chickweed) as a biological treasure rather than something to be cleared or ignored?
- **The power of perspective:** Which plant’s “story” (e.g., the resilient dandelion in the concrete or the protective linden tree) led to the most surprising emotional or sustainability-focused insights?
- **Sensory connection:** Did the focus on scent and texture (the smell of linden, the soft carpet of chickweed) help stressed students ground themselves and find a “mental sanctuary” in the schoolyard?

- **Shared resources:** Did the students' comments during the tea/salad tasting suggest they now see the local green space as a "shared pharmacy" that they have a responsibility to care for?

2. Reflecting on pedagogical performance

- **Managing the deceleration:** Did I allow for enough quiet time during the "Sensory Circle" to ensure students moved from their fast-paced academic mindset into a state of nature-based awareness?
- **Facilitating the shift:** How effectively did I guide the transition from the "scientific" identification of plants (using apps) to the "emotional" identification (sharing memories and scents)?
- **The narrative bridge:** How successfully did I bridge the gap between a physical plant "beneath our feet" and the abstract concept of personal growth and resilience?
- **Facilitating agency:** Did the hands-on "Tea House" and "Salad Bar" activities effectively transform the students from passive observers into active creators of their own wellbeing?

3. Reflecting on personal growth and impact

- **Shift in perception:** How has my own view of the school's/parks "neglected corners" changed after hearing the memories and stories my students associated with the plants found there?
- **The value of the common:** Did the realization that these "treasures" are free and accessible to everyone change the way I value outdoor learning compared to traditional classroom resources?
- **"Weeding" your teaching (growth mindset):** Just as we transformed "weeds" into "treasures" today, which of your teaching habits should be removed to make room for something better? What is the one new "seed" of an idea you want to bring to your next lesson?

1. **Common Nettle** (*Urtica dioica*)	Stem: Four-sided (square), rigid, and grows upright. Leaf: Egg-shaped (ovate) with serrated (saw-toothed) edges.	Identification: The stem and leaves are covered in tiny, transparent, stinging hairs.

 		
2. Dandelion *(Taraxacum officinale)*	Flower: Bright yellow composite flower head. Leaf: Arranged in a basal rosette; the edges are jagged and tooth-like.	Identification: If broken, a white milky sap (latex) leaks out. When mature, it forms a white "puffball" (clocks).
 		

3. Ribwort Plantain *(Plantago lanceolata)*	Leaf: Long, narrow, lance-shaped, growing in a basal rosette. Venation: 3–5 prominent parallel veins run along the length of the leaf.	Identification: Leaves hug the ground; flowers are brown, cylindrical spikes on long, leafless stalks.

4. Small-leaved Linden *(Tilia cordata)*	Leaf: Characteristic heart shape with serrated edges. Flower: Yellowish-white and fragrant.	Identification: The flower cluster is attached to a pale green, tongue-shaped bract (specialized leaf).

5. White Acacia / Black Locust *(Robinia pseudoacacia)*	Trunk: Deeply furrowed, grayish-brown bark. Flower: White, sweet-smelling clusters hanging down.	Identification: Pairs of sharp thorns are often found at the base of the leaf stalks.

 		
6. Chickweed *(Stellaria media)*	Stem: Low-growing, sprawling, with a single line of tiny hairs running down one side. Flower: Tiny, white, star-shaped flowers with five petals (deeply split, so they look like ten).	Identification: Forms a soft, bright green carpet; the leaves are small and oval.
 		
7. Shepherd's Purse *(Capsella bursa-pastoris)*	Stem: Thin, upright, branching at the top. Fruit: Heart-shaped or triangular flat pods (purses).	Identification: A basal rosette of leaves at the bottom; distinct heart-shaped "purses" along the upper stem.

Reference Links (Sources)

Ribwort Plantain:

https://naturland.hu/gyogynovenytar/landzsas-utifu/

https://www.szenzaciooo.hu/a/landzsas-utifu-a-termeszet-gyogyito-kincse

Small-leaved Linden:

https://www.magozz.hu/termek/kislevelu-hars-tilia-cordata-20db-mag/

http://erdokostolo.blogspot.com/2021/06/a-kislevelu-hars-tilia-cordata.html

White Acacia (Black Locust):

https://www.magozz.hu/termek/feher-akac-robinia-pseudoacacia10db-mag/

https://www.dunaipoly.hu/hu/tudasanyag/feher-akac

Chickweed:

https://agroforum.hu/szaktanacsadas-kerdesek/eheto-mar-a-tyukhur/

https://www.agrarszektor.hu/kiskert/20201106/tyukhur-gyogynoveny-es-gyomnoveny-egyben-tyukhur-csepp-tyukhur-tea-hol-kaphato-25814

Shepherd's Purse:

https://herbanyus.hu/gyogynoveny/pasztortaska-capsella-bursa-pastoris/

https://ezerjofu.hu/pasztortaska-gyogynoveny?srsltid=AfmBOooj_TtbDtGIL1mTNqQpd9gbohVGW1bEb3z4IL0mZ5RbrMPDqN5c

Content for the 2nd lesson information cards

1. Common Nettle (*Urtica dioica*) – "The stinging master"

- **Why is it good?** One of our most versatile plants. Despite its sting, it has extraordinary nutritional value and is a bio-gardener's best friend.
- **Biology:** A perennial plant that thrives in nitrogen-rich, disturbed soils. Its leaves and stems are covered in tiny stinging hairs stiffened with silica.
- **Chemistry/usage:** Contains formic acid (the sting), plus high amounts of iron, magnesium, and vitamin C. Traditionally, people with rheumatism were "beaten" with fresh nettle for the formic acid. As a tea, it is a blood purifier and diuretic. Its root extract is used in shampoos to strengthen hair and reduce loss. In the kitchen, it is used as a pottage or in spring soups. It can also be made into "nettle tea" fertilizer for plants or as a spray against aphids.
- **Well-being:** Teaches us that great value lies behind a "prickly" exterior. Helps in setting boundaries and internal cleansing.

2. Dandelion (*Taraxacum officinale*) – "The symbol of life-affirmation"

- **Why is it good?** Nearly indestructible; every part (root, leaf, flower) is useful.
- **Biology:** Its taproot goes deep, improving soil structure. It has a composite inflorescence, and its fruit is the well-known "winged" achene (the blowball).
- **Chemistry/usage:** A powerful herb for liver and gallbladder function, a strong diuretic, and detoxifier. Young leaves are excellent for salads. Flower buds preserved in oil are used for inflammation. Roasted roots make a coffee substitute. The bitter compounds in the root and leaves stimulate digestion.
- **Well-being:** A symbol of resilience: it blooms even in concrete cracks. The yellow color brings cheer, while blowing the "puffs" brings childlike joy.

3. Ribwort Plantain (*Plantago lanceolata*) – "Nature's band-aid"

- **Why is it good?** It literally grows along our path and provides immediate help for minor injuries.
- **Biology:** A rosette-forming plant with characteristic parallel-veined leaves, making it very easy to identify.
- **Chemistry/usage:** Its main active ingredient is aucubin (antibacterial). Tea from dried leaves is used for clearing mucus, coughing, and inflammation. A syrup made from fresh leaves and honey is an excellent cough suppressant. Freshly crushed leaves help heal insect bites and small wounds.
- **Well-being:** Symbolizes care. Reminds us that solutions are often closer than we think.

4. Small-leaved Linden (*Tilia cordata*) – "The tree of community and calm"

- **Why is it good?** Its scent is a defining spring/summer experience. Symbolically, it is the central tree of villages and communities.
- **Biology:** A long-lived tree with heart-shaped leaves. The bract attached to the flower cluster helps the fruit disperse with the wind.
- **Chemistry/usage:** Contains flavonoids and essential oils. Linden tea is an excellent diaphoretic (induces sweating), cough suppressant, and mucus thinner for colds, and a sedative during stressful times. It also aids sleep.
- **Well-being:** Its scent is proven to reduce anxiety. The heart-shaped leaves symbolize love and peace.

5. White Acacia (*Robinia pseudoacacia*) – "The fragrant survivor"

- **Why is it good?** Though treated as an invasive species, it is vital for honey production and folk medicine.
- **Biology:** A leguminous tree with nitrogen-fixing bacteria on its roots. Flowers hang in clusters.
- **Chemistry/usage:** Flowers are rich in flavonoids (robinin) and essential oils. The tea is an antacid, helping with heartburn and reflux. It is a good cough suppressant. The flowers are edible: dipped in pancake batter and fried, they are a delicacy. (Note: other parts of the tree are toxic.)
- **Well-being:** Its scent brings a sense of late-spring freedom. Teaches us how to be useful even in an environment where we are "newcomers."

6. Chickweed (*Stellaria media*) – "The gem of the garden"

- **Why is it good?** Many consider it an annoying weed because it spreads fast, but it is one of our most delicious edible wild plants.
- **Biology:** Extremely resilient, capable of blooming all winter during milder days.
- **Chemistry/usage:** Lowers cholesterol, aids bile and kidney function. High in Vitamin C and minerals (potassium, calcium). Best raw in salads (tastes like tender green peas). Can also be brewed as a tea.
- **Well-being:** Has a soft, carpet-like touch; touching it is inherently calming.

7. Shepherd's Purse (*Capsella bursa-pastoris*) – "Nature's pharmacy"

- **Why is it good?** Children love its bag-shaped seed pods, which make it instantly recognizable.
- **Biology:** Part of the Brassicaceae family. The "bags" (silicles) are heart-shaped.
- **Chemistry/usage:** A strong hemostatic (stops bleeding; traditionally used on wounds). As a tea, it is used for muscle pain or blood pressure regulation. Also used for heavy menstrual cycles and nosebleeds.
- **Soft skill/analogy:** Resilience - it grows anywhere, even in concrete cracks; it is tough and adaptable.

Lesson 3
Outdoor Research Adventure on Margaret Island

Topic: Biodiversity exploration and physical endurance development in nature

Subject: Physical education, Natural Science, Biology

Developed competencies: Environmental awareness, team leadership, digital data collection, movement coordination

Target group: Ages 14–19 (secondary school)

Location: Margaret Island (Great Meadow and designated research zones)

Duration: 2–3 × 45 minutes

Timing: Spring or autumn

Adaptability:

- **Age group:** Easily adaptable for upper primary and secondary students
- **International use:** The method stays the same; the observed flora and fauna can be adapted to the local environment
- **Language:** Conducted in Hungarian, but suitable for bilingual teaching

Learning objectives:

- **Sustainability awareness:** Students gain direct experience with the island's ecosystem and understand the importance of biodiversity in urban green spaces.
- **Social-emotional learning (SEL) and wellbeing:** Outdoor movement reduces school-related stress. Empathy and self-awareness develop through shared tasks and responsibility.
- **Social inclusion:** Different roles (leader, photographer, tower builder, safety supporter) allow every student to contribute according to their strengths.

Educational goals:

- **Environmental education:** Respect and protection of natural values
- **Value exploration:** Recognizing environmental and personal strengths
- **Empathic sensitivity:** Supporting each other and paying attention to the environment
- **Technical skills:** Conscious use of smartphones and apps for research
- **Responsibility:** Practicing leadership and teamwork
- **Group cohesion:** Strengthening class community through shared experiences

Training goals

- **Experiential learning:** Direct engagement with local wildlife
- **Extending knowledge:** Applying biological and environmental knowledge in real research
- **Self-awareness:** Recognizing physical, mental, and coordination abilities
- **Learning through play:** Integrating knowledge into playful, experience-based tasks

Transversal skills

- **Observation:** Identifying and documenting species with digital tools

- **Critical thinking:** Understanding the link between environmental values and personal responsibility
- **Communication & collaboration:** Effective information sharing within teams (Messenger group)
- **Creative problem-solving:** Completing physical challenges (e.g., human ladder)

Key competences developed

- **Environmentally conscious citizenship**
- **Leadership skills**
- **Systems thinking:** Balancing physical activity with focused research

Materials (low-cost and inclusive)

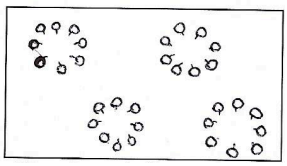
- **Research kit:** Map of Margaret Island, coloured team vests
- **Digital tools:** Smartphones for species documentation and team communication
- **Sports equipment:** 10 stones (tower challenge), football, volleyball, rounders equipment, frisbee, badminton rackets

Summary

The “Research Adventure” on Margaret Island expands the traditional PE lesson within the CONNECT project framework. Students act as **Citizen Scientists**, mapping the island’s biodiversity while completing physical challenges. The lesson is built on playful, experiential learning: photographing plants, insects, and animals, building stone towers, and placing marker ribbons at height. The final evaluation and the promised class trip strengthen intrinsic motivation and the sense of belonging.

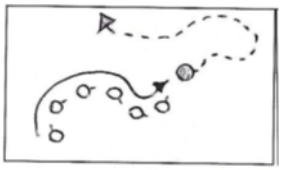
WARM-UP

1. Creative gymnastics tasks (4 minutes)



Goal: Preparing muscles and joints; increasing circulation; walking–running–jumping tasks
Teacher instruction: “Form circles and take turns showing a warm-up exercise to your group. The others should imitate it as accurately as possible. Switch on the whistle!”

2. “Follow the leader” (4 minutes)



Goal: Increasing circulation; dynamic movement tasks
Teacher instruction: “You will warm up by walking, running, and jumping in freely chosen directions. I will choose the first leader. They show an exercise while running, then on the whistle they move to the back of the line and the next person takes over.”

3. Choosing team leaders

Teacher instruction: “Your first important task is to choose a team leader! Nominate someone from your group. If you can’t agree, vote — the person with the most votes becomes the leader.”

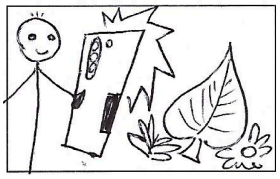
POINT-COLLECTING TASKS

Goals: Environmental education; discovering local wildlife; endurance; teamwork; communication; team spirit **Required tool:** Map of Margaret Island

Task introduction (2 minutes)

Teacher instruction: “Today you will complete several tasks while exploring the wildlife of Margaret Island. Each task lasts 20 minutes. Between tasks you’ll have time to rest or try additional skill challenges.”

I. Plant collection (20 minutes)

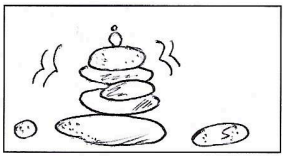


Photograph as many different plant leaves as possible within 20 minutes. Team leaders receive a map and must create a Messenger group where members upload their photos. After 20 minutes, the leader presents the collected photos.

Scoring: Each different plant species = 1 point. The team with the most points wins.

1st: 1 point / 2nd: 0.5 point / 3rd: 0.25 point / 4th: 0 points

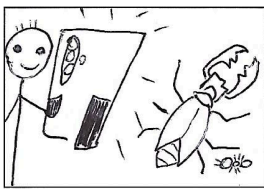
II. Stone tower challenge (10 minutes)



Goal: Balance, fine motor skills, creativity
Task: Each team leader selects one skilled student. They have 60 seconds to build **one tower** using the 10 stones. The tower must contain as many stones as possible and remain stable.

Scoring: 1st: 1 point 2nd: 0.5 point 3rd: 0.25 point 4th: 0 points

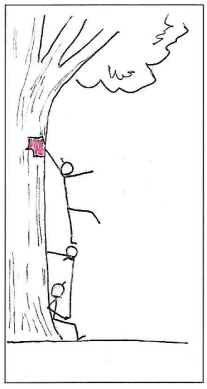
III. Insect collection (20 minutes)



Goal: Teamwork; communication; team spirit; organizational skills
Teacher instruction: “You now have 20 minutes to photograph insects and bugs. The rules are the same as in the plant round. Ready, go!”
“Time’s up! Team leaders, please present your photos. While I check the scores, you will complete a strength and skill challenge.”

Scoring: 1st: 1 point 2nd: 0.5 point 3rd: 0.25 point 4th: 0 points

IV. Who can reach the highest? (10 minutes)



Goal: Creativity, teamwork, courage

Teams choose 3 brave members. Each team receives a coloured ribbon to place as high as possible on a designated tree trunk. Students may form a **human ladder** to help the climber. The highest ribbon wins. Teams start in order of their current ranking.

Scoring: 1st: 1 point / 2nd: 0.5 point / 3rd: 0.25 point / 4th: 0 points

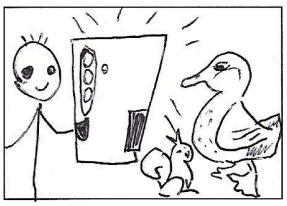
Safety Notes

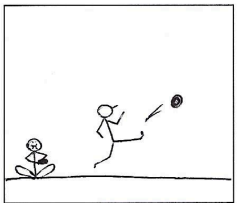
- Maximum ribbon height: **2.5–3 meters**
- Task only begins with **teacher approval and supervision**
- Base supporters stand in a stable, wide stance
- No standing on shoulders; climber may step only on clasped hands or thighs
- Other team members form a **safety circle**
- Only healthy, stable trees may be used
- Closed sports shoes required
- Ground must be flat and obstacle-free
- **Veto rule:** Any participant may stop the attempt at any time
- Optional 1-minute "mini-conference" on balance and centre of gravity

V. Animal collection (20 minutes)

Goal: Environmental education; discovering wildlife; endurance; teamwork; communication; team spirit

Teacher instruction: "You now have 20 minutes to photograph vertebrates (mammals, birds, reptiles, amphibians). Same rules as before. Ready, go!"
"Time's up! While I check the scores, you may eat lunch or play freely on the meadow. Take balls, frisbees, or rackets with you!"





CLOSING – EVALUATION (3 minutes)

Goal: Praise; intrinsic motivation; closure

The teacher evaluates the teams' work and announces the results.

Closing message: "Everyone is valuable, and everyone is good at something. Today you learned not only about the island's wildlife, but also about each other — who excels at what, and how each of you contributes to the success of a small community.

Your collective reward is a class trip to the Duna–Dráva National Park, including a guided cycling and canoe tour, and a historical visit to the Mohács Memorial Site, marking the 500th anniversary of the 1526 battle."

Post-Lesson Teacher Reflection

This section helps you reflect on how successfully the lesson met its goals and how effectively you supported students in exploring nature through movement, teamwork, and citizen-science activities.

1. Reflection on students and the natural environment

- **Observation vs. performance:** How did students handle the challenge of balancing fast-paced movement (time limits, competition) with careful scientific observation while photographing plants, insects, and animals?
- **Shifts in perspective:** Which task (plants, insects, or vertebrates) sparked the strongest reactions or the most surprising discoveries? Was there a species or moment that triggered emotional or sustainability-related insights?
- **Team dynamics in an open environment:** How well did groups cooperate in a large outdoor space without constant direct supervision? Did natural roles emerge (navigator, photographer, spotter, leader)?
- **Shared responsibility for nature:** Based on their behaviour during data collection, did students show growing respect for the environment? Did the experience help them see the island as a shared natural space they are responsible for?

2. Reflection on pedagogical performance

- **Creating structure outdoors:** Was the balance between freedom of movement and safe, organised task execution successful?
- **Clarity of instructions:** Did students clearly understand the goals and rules of each task? Did the point-based competition motivate them in a healthy way?
- **Supporting the "Citizen Scientist" mindset:** How effectively did you guide students toward a research-oriented attitude? Did they behave like observers and data collectors, or did the competitive aspect dominate?
- **Facilitating physical and creative challenges:** How well did you support teams during the stone-tower and "reach the highest point" tasks? Did students follow safety rules consistently?

3. Reflection on personal growth and impact

- **Teacher role transformation:** How did you experience the shift from traditional instructor to facilitator and guide? Was it easy or challenging to let go of classroom-style control?
- **Re-imagining nature as a learning space:** How has your perception of Margaret Island changed as a "classroom"? What new opportunities do you see for future outdoor learning?

- **Your teaching practice:** Which teaching habit of yours could you let go of to make room for something better?

DANUBE FIELDWORK – PROJECT PORTFOLIO

1. Project Overview

This portfolio presents a complete three-session integrated science project focusing on the ecological, chemical, and physical investigation of the Danube River. The project combines fieldwork, laboratory analysis, environmental interpretation, and reflection, following a structured inquiry-based approach.

Subject: Integrated natural sciences (Chemistry – Biology – Physics – Environmental Studies)

Target Group: Upper secondary school students (Grades 9–12)

Location: Danube riverbank (field measurements) and school laboratory

Duration: 3 × 2–3 lessons (approximately 6–9 lessons in total)

Timing: Spring or autumn period (ideal under stable water levels and safe field conditions)

Adaptability:

- **Age group:**
  Differentiated for Grades 8–12; with simplified measurement methods, it can also be adapted for younger learners.
- **International dimension:**
  The activity can be implemented in any river or standing-water environment; it is well suited for international projects (e.g. Erasmus+) and comparative water quality studies.
- **Language:**
  Usable with Hungarian and English documentation; highly suitable for developing subject-specific foreign language vocabulary. / Can be adapted to any language.

2. Learning Goals and Competencies

• Understanding water quality indicators: dissolved oxygen, nutrients, pH, conductivity.

• Performing hydrodynamic and biological measurements in the field.

• Applying analytical methods (Winkler titration) and and recognising the role of microplastic pollution.

• Developing data literacy, environmental reasoning, and scientific communication skills.

• Synthesising data and drawing environmental conclusions.

Sustainability Awareness

Students recognise the impact of human activities on water quality, understand the consequences of eutrophication and microplastic pollution, and become aware of their own responsibility in water

protection.
The project strengthens environmental responsibility and conscious, sustainable behaviour.

Social and Emotional Learning (SEL)

- Taking responsibility within group work
- Building trust and cooperation in a fieldwork environment
- Developing self-awareness and reflective thinking
- Emotional connection to nature through environmental experiences

Physical – Mental – Emotional well-being

Learning in natural environments reduces stress, increases focus and attention, and strengthens inner balance.
Water as a symbolic element (purity, flow, renewal) supports deeper reflection and the development of ecological awareness.

Social Inclusion

The project is based on cooperative group work in which each student is assigned a specific role (chemistry, physics, biology, microplastic analysis).
Differentiated tasks allow the inclusion of students with diverse abilities, strengthening cooperation and mutual acceptance.

Development of Transversal Skills

- **Observation:** Conscious and structured observation of natural phenomena, organisms, and measurement results.
- **Critical thinking (mindset shift):** Comparing data with biological indicators; identifying sources of error; integrating multiple perspectives.
- **Communication and collaboration:** Group-based research planning, field coordination, joint data interpretation, and short scientific presentations.
- **Creative problem-solving:** Managing measurement challenges in field conditions; formulating hypotheses and seeking alternative explanations.

Key Competences Developed

- Scientific and technological competence
- Mathematical competence (calculations, units of measurement, proportions)
- Digital competence (measurement tools, data processing)
- Communication in the mother tongue and foreign languages
- Social and civic competence
- Learning to learn
- Environmentally responsible civic attitude

3. Session Structure

Session 1 – Preparation, Methods, Research Design

Students were introduced to oxygen measurement techniques (Winkler, DO-meter, colour tests), biological indicators, and microplastic types. The session included planning field roles, identifying sampling points, and reviewing safety guidelines.

Session 2 – Fieldwork: Data Collection

Field measurements included: water temperature, flow velocity, Secchi transparency, Winkler fixation, pH, EC, nitrate and phosphate checks, biological observations, and microplastic filtration. Students filled out their logbooks and prepared samples for laboratory analysis.

Session 3 – Laboratory Analysis and Interpretation

Laboratory tasks included Winkler titration, microplastic sample cleaning (H_2O_2 digestion, salt flotation), and microscopic examination of biological samples. Students calculated oxygen concentration, interpreted ecological indicators, and synthesised their findings.

4. Materials and Resources Used

• Winkler reagents and glassware

• DO-meter, pH meter, conductivity meter

• Hydrodynamic measurement tools (tape measure, stopwatch)

• Microplastic filtration equipment and laboratory supplies

• Biological identification keys and microscopes

5. Evidence of Learning and Outcomes

• Completed student logbooks documenting all measurements and reflections.

• Laboratory titration sheets with calculated O_2 concentrations.

• Microplastic tables summarising particle types and characteristics.

• Biological sketches and species identification.

• Final written reflections on environmental connections and human impacts.

6. Teacher Reflection and Notes

The project successfully engaged students in multidisciplinary inquiry, strengthening both procedural and conceptual understanding. Students demonstrated strong collaboration skills and increased awareness of environmental challenges affecting the Danube River.

Future improvements include expanding the sampling area, integrating GIS mapping, and incorporating long-term water quality datasets for comparison.

7. Appendices

- Lesson Plan (English version)

- Student Logbook (English version)

- Quick Reference Sheet

- Teacher Guide

COMPLEX INTEGRATED SCIENCE PROJECT – 3×(2–3 HOURS) LESSON PLAN

Topic: Comprehensive examination of Danube water quality (chemistry–biology–physics–environmental awareness).

1. Session (2–3 hours): Preparation, Methods, Research Planning

Goal: Understanding methods; forming research question and hypothesis; planning field workflow and roles.

Competencies: scientific reasoning, experiment planning, prediction, communication, cooperation.

Activities:

• Motivational introduction about water–cleanliness–responsibility.

• Overview of O_2 measurement methods: Winkler, DO-meter, colour tests (NO_3^-/PO_4^{3-}), pH, EC.

• Teacher demonstration of Winkler fixation and titration (critical points: bubbles, iodine loss).

• Biological indicators and microplastic types (fibres, fragments, films, pellets).

• Research planning: group formation (chemistry/biology/physics/microplastic), sampling points, equipment list, distributing the logbook.

2. Session (2–3 hours): Fieldwork – Data Collection

Goal: Accurate and safe sampling under real conditions; primary data recording.

Competencies: instrumental observation, measurement precision, environmentally conscious behaviour, situational awareness.

Activities:

• Safety briefing; confirming roles and responsibilities.

• Physics: v = s/t (10–20 m), water temperature, Secchi transparency, environmental observations.

• Chemistry: Winkler fixation on-site, pH, EC, optional NO_3^-/PO_4^{3-} colour test.

• Biology: collecting/identifying organisms under stones; species list.

• Microplastics: filtering 50–100 L; sample labelling.

• Recording data in the student logbook; transporting samples to the laboratory.

3. Session (2–3 hours): Laboratory, Calculation, Interpretation, Closing

Goal: Performing titration and calculations; synthesising results; completing logbook and reflection.

Competencies: analytical reasoning, calculation, data interpretation and visualisation, systems thinking, scientific communication.

Activities:

• Winkler titration (acidification → I_2; thiosulfate; endpoint: straw-yellow + starch → colourless).

• Preparing microplastic samples: H_2O_2 digestion (24 h), NaCl flotation; microscopic counting (demo if time is limited).

• Microscopic biological examination; drawings/photos, short comments.

• Calculations: O_2 mg/L and saturation (%), comparison with Danube reference values; identifying sources of error.

• Synergies: velocity ↔ O_2 ↔ organisms ↔ microplastic distribution.

• Closing: finalising logbook; group reflection (2–3 sentences).

Assessment and Outcomes

• Formative: adherence to field protocol, data sheet accuracy, safety compliance.

• Summative: quality of logbook (method clarity, calculations, interpretation, conclusion), optional short group presentation.

Teacher Guide – Danube Fieldwork (Full English Translation)

1. Lesson framework and learning objectives

Context: This annex supports a 3×45-minute complex science lesson combining field and laboratory activities at the Danube. Main goals: dissolved oxygen determination (Winkler, DO-meter or colour test); interpreting nitrate, phosphate, pH and conductivity; hydrodynamic basic measurements; biological indication and microplastic detection; synthesising data and evaluating environmental status. Competencies: measurement accuracy, data interpretation, redox reasoning, ecological thinking, safety awareness.

2. Choosing the method for dissolved oxygen

A) Winkler titration: oxygen is chemically fixed, iodine is released and titrated with thiosulfate. Very precise; requires on-site fixation. B) Digital DO-meter: fast, suitable for depth/time comparison. C) Colour tests: safe, student-friendly, suitable for shoreline work.

3. Reference values for interpretation (Danube)

O_2: 8–12 mg/L optimal; <4 mg/L critical. Nitrate: <10–25 mg/L preferred. pH: 7.8–8.4. Conductivity: 300–600 µS/cm. Biological synergy principle: weak chemistry → check stones; presence of leeches/chironomids confirms low quality.

4. Winkler oxygen determination – detailed teacher guide

Reagents: $MnSO_4$, alkaline KI, concentrated H_2SO_4/H_3PO_4, $Na_2S_2O_3$ (0.01 or 0.0125 M), 1% starch. Equipment: Winkler bottles (100–250 mL), pipettes, burette, Erlenmeyer flask, PPE. Chemical equations are preserved: fixation, acidic dissolution, titration. Sampling caution: avoid air bubbles; close bottle underwater. On-site: only fixation (I+II); in lab: acidification and titration immediately.

5. Hydrodynamic measurement – “mini-boat method”

Tools: measuring tape (10–20 m), stopwatch, floating object. Measure s and t → v = s/t. Note turbulence and eddies. Synergy: faster flow = higher O_2; slow bays accumulate microplastics and fine sediment.

6. Microplastics and biological indication

Sampling: filter 50–100 L water (30–50 µm). Lab: H_2O_2 digestion, NaCl flotation, microscope. Hot needle test for ID. Indicator species: mayfly/caddis (clean), amphipod/water louse (tolerant), chironomid/leech (polluted).

7. Site-specific notes – Százhalombatta

Expected conditions: high flow stabilises O_2; nutrients reflect Budapest effluents. Fine sediment; possible H_2S smell near anaerobic zones. Oil film indicators: rainbow sheen; surface-tension dependent fauna affected. Warm-water discharge downstream lowers O_2 saturation.

8. Safety and logistics

PPE required. Handle acids/bases only with teacher supervision. Collect chemical waste separately. Wait at least 10 minutes after ship waves before sampling.

9. Assessment guide

Velocity: 0.5–1.2 m/s typical. O_2 saturation: 90–110% excellent; >110% oversaturation; <50% critical. Microplastics: near urban areas, fibres dominate.

10. Introductory text

Water is not merely H_2O; it symbolises purity and renewal. Turbid water hides life, just as an unsettled mind cannot reflect clearly. When examining the Danube, students see a reflection of collective responsibility. “Only clear springs give clear water.”

DANUBE FIELDWORK – QUICK REFERENCE SHEET

I. ON-SITE IMMEDIATELY (mandatory)

Physical parameters: Water temperature; v = s/t (10–20 m); Secchi transparency; weather notes.

Chemistry: Winkler fixation ($MnSO_4$ + alkaline KI, within 1–2 minutes), pH, EC, optional NO_3^-/PO_4^{3-} colour test.

Biology: Collect/identify organisms under stones (mayfly, caddisfly, amphipod, water louse, chironomid).

Microplastics: Filter 50–100 L water through 30–50 µm mesh (labelling required).

II. IN THE LAB (post-processing)

Winkler titration: Acidification → I_2; thiosulfate endpoint: straw-yellow + starch → colourless (titrate immediately).

Microplastics: H_2O_2 digestion (24 h), saturated NaCl flotation, microscopic counting, hot needle test.

Biology/plankton: Microscope, drawings, photos, species list.

III. Quick Winkler calculation: 100 mL sample + 0.0125 M thiosulfate → 1.00 mL ≙ 1.00 mg/L O_2.

General: mg/L O_2 = C_thio × V_thio(mL) × 80 (with 100 mL sample).

IV. Danube reference values: O_2 8–12 mg/L optimal; <4 mg/L critical. pH 7.8–8.4. EC 300–600 µS/cm. NO_3^- <10–25 mg/L preferred.

Biological indicators: Good – mayfly/caddis; Moderate – amphipod/water louse; Polluted – chironomid/leech.

V. Hydrodynamics – synergies: Faster/turbulent flow → higher O_2; slow bays → microplastic + fine sediment deposition.

VI. Safety: goggles, gloves; acids/bases only with supervision; chemical waste separate (never into the Danube); wait 10 minutes after boat traffic.

Student Logbook – Danube Fieldwork (Complete English Version)

I. Basic Information

Group/Name: .....

Location (GPS): .....

Date/Time: .....

Weather (°C, wind, cloud cover): .....

II. Physical and Hydrodynamic Measurement

Measured distance s (m): .....

Measured time t (s): .....

Calculated surface velocity v = s/t (m/s): ..... (×3.6 = ... km/h)

Observations (eddy, “white water”): .....

III. Chemical Measurements

Method for O_2 measurement: ☐ Winkler ☐ DO-meter ☐ Colour test

Water temperature (°C): .....

Dissolved oxygen (mg/L): .....

O_2 saturation (%): ..... (Based on nomogram/reference table)

pH: ..... EC (µS/cm): .....

Nitrate NO_3^- (mg/L): ..... Phosphate PO_4^{3-} (mg/L): .....

IV. Biological Observations (stones, shoreline habitat)

Photographed/drawn species: .....

Identification: ☐ Mayfly larva ☐ Caddisfly larva ☐ Amphipod ☐ Water louse ☐ Chironomid larva ☐ Leech

Conclusion on water quality (Class I–V): .....

V. Microplastic Analysis (after filtering 50 L)

Filter type/mesh size (µm): .....

Hot needle test observation: .....

Type	Estimated count	Dominant colour	Notes (shape, flexibility)
Fibres (textile)	.....	.....	.....
Fragments	.....	.....	.....
Films (thin packaging)	.....	.....	.....
Pellets (industrial beads)	.....	.....	.....

VI. Winkler Calculation Sheet

Sample volume V_sample: 100 mL (recommended)

Thiosulfate concentration C_thio: 0.01 M / 0.0125 M

Thiosulfate consumption V_thio (mL): ..... mL

Formula: mg/L O_2 = (C_thio × V_thio(mL) × 80) [for 100 mL sample]

Quick rule: with 0.0125 M → 1.00 mL ≙ 1.00 mg/L (for 100 mL sample)

VII. Summary Questions

☐ How did water velocity relate to dissolved oxygen? — Answer: .....

☐ Do the chemical results (O_2, NO_3^-, PO_4^{3-}, pH, EC) match the needs of the organisms found? — Answer: .....

☐ Where and why did you observe greater microplastic accumulation? — Answer: .....

☐ What would you expect 2 km downstream (warm-water effect, industrial influence)? — Answer: .....

VIII. Safety Checklist

☐ Wearing goggles and gloves

☐ Collecting chemical waste separately

☐ Labelling samples (location, time, group)

Appendix: Quick Biological “Cheat Sheet”

Animal	Characteristic feature	Drawing tip
Mayfly larva	3 tail filaments, lateral gills	Three thin lines at abdomen end
Caddisfly larva	Pebble/plant “case”	Tubular, grainy case
Amphipod	Side-flattened “comma” shape	Curved line with many small legs
Water louse	Top-flattened, slow	Flat segmented back
Chironomid larva	Bright red, segmented “worm”	Thin segmented line

Post-Lesson Reflection – Guiding Questions

1. Reflection on Students and the Natural Environment

• **Data versus living reality:**
How did students' attitudes toward "numbers" change when they were able to connect measured values (oxygen level, pH, conductivity) to living organisms and observable environmental phenomena (water flow, sediment, smells)?

• **Making the invisible visible:**
What reactions did students show when they realised that human impacts (microplastics, nutrient loading) are often barely visible to the naked eye, yet play a decisive role in aquatic ecosystems?

• **Learning from the current:**
Did observing the movement of the river (speed, eddies, turbulence) help students understand the concepts of "change" and "balance" not as abstract ideas, but as lived experiences?

• **Responsibility as shared space:**
During sampling and documentation, did the idea emerge that the Danube is not just an "external subject of study," but a shared resource for which we carry both personal and collective responsibility?

2. Reflection on Pedagogical Performance

• **Balancing precision and freedom:**
How successfully did I maintain the balance between scientific accuracy (measurement discipline, safety) and the freedom of exploration, especially during fieldwork?

• **From measurement to meaning:**
How effectively did I support students in transforming instrument-generated data into meaningful environmental narratives and interpretations?

• **Questioning as a compass:**
Which of my guiding questions most effectively encouraged systems thinking (e.g., linking water velocity – oxygen – living organisms), and which may have been too directive?

• **Supporting active agency:**
Did the role-based structure (chemistry, biology, physics, microplastic analysis) genuinely enhance autonomy and accountability, or would more flexible role rotation have strengthened engagement?

3. Reflection on Personal Development and Impact

• **The river as a teaching partner:**
How has my own relationship with the Danube changed — did it shift from being merely a teaching location to becoming a learning partner?

• **Trusting the process:**
To what extent was I able to let go of a predetermined instructional pathway and trust that students' observations and questions could open valuable learning directions on their own?

• **The human face of science:**
Did this project help me see science less as a purely technical discipline and more as a human, ethical, and responsibility-driven practice?

• **New ideas for future lessons:**
Which element of this experience would I integrate regularly into my teaching practice (e.g., field data collection, reflective journaling, slower observation)?
What is one concrete change I would implement in my next lesson to foster deeper learning?