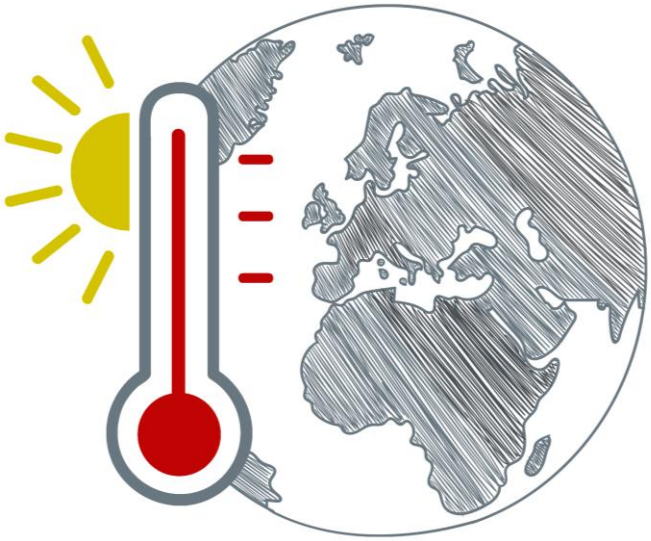


Funded by the Erasmus+ Programme of the European Union

CCEDU TEACHER'S GUIDEBOOK

Simplify climate change education for better communication in elementary and lower secondary school

Funded by the Erasmus+ Programme of the European Union

The CCEDU project

The CC-EDU Simplify climate change education for better communication in elementary and lower secondary school with project number 2019-1-FR01-KA201-063200, is a 24 month long strategic partnership composed by

- **Sustainable Development Management Institute, France**
- **Associazione progetto MARCONI, IT**
- **Center for Educational and Cultural Development "RACIO", North Macedonia**
- **Sehit Mehmet Lutfi Gulsen Anadolu from Konya Turkey**
- **SMART IDEA Slovenia**
- **Fondatsia Evropeiski center za inovatsii, obrazovanie, nauka i kultura, Bulgaria**

As a whole, the wide experience gathered for the CC-ED project, will offer complementary skills and competencies, necessary for offering tools and resources for helping EU teachers in develop a wide set of skills, encompassing communication skills, competence in climate change and related science and social topics, necessary to nurture EU students and help them face future challenges.

Product prepared with the contribution of the consortium,

Main editors Sara CURIONI, Valeria ELIA

All materials are available for free download and use via the project's website.

https://ccedu.erasmus-projects.eu/

Final version, released in November 2020

Funded by the
Erasmus+ Programme
of the European Union

Table of Contents

Funded by the Erasmus+ Programme of the European Union

About the CCEDU resources

The purpose of the CC-EDU project is equipping students (such as the next generations) in having a holistic perspective over climate change and learn about collective responsibility toward environment protection and prevention of further damaging situations. The aim of the project is preparing teachers to deal with the complexity of the topic, making it factual and with a view on local, regional, and international situations, using different approaches.

Climate change should occupy a major node in school education. Given the actual situation, it is important that schools tie climate change education to their communities, teaching their students both civic engagement and providing important examples of how solutions are being developed to global issues in real-time.

CCEDU support tools

CCEDU GUIDEBOOK

This guidebook will help the teachers understand and get to discuss climate change with the students. The guidebook will offer reading materials to help teachers to deal with some of the many challenging questions: How should such a complex topic be approached in schools? How much should be explained, based on the age of the students? How can teachers create hope instead of anxiety? On one hand, teachers have to be sensitive and prepared to deliver the contents, on the other, students have to be aware and develop skills to contribute to solve the situation.

12 CLIMATE CHANGE RELATED TOPICS

The CCEDU portal offers 12 topics concerning climate change. They are introduced in a short summary that is visible to all users on the website, and in a more wider and accurate way for registered users. More in details, in order to simplify the complexity of climate change, we selected the following issues connected :

- **Air pollution** have a complex relationship with climate change. Some pollutants, such as black carbon and ozone, increase warming by trapping heat in the atmosphere, while others, such as sulphur dioxide forming light reflecting particles, have a cooling effect on the climate.

- **Aquatic and wetland ecosystems** are very vulnerable to climate change. The metabolic rates of organisms and the overall productivity of ecosystems are directly regulated by temperature.Carbon and greenhouse gas management
- Climate change affects the **social and environmental determinants** of **health** – clean air, safe drinking water, sufficient food and secure shelter. Between 2030 and 2050, climate change is expected to cause approximately 250 000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress.
- **Economic implications of climate change.** In 2019, climate change contributed to **extreme weather events** causing at least $100 billion in damages.
- Climate change is expected to worsen the frequency, intensity, and impacts of some types of **extreme weather** events. For example, sea level rise increases the impacts of coastal storms and warming can place more stress on water supplies during droughts
- **Food and drinking shortages.** A half-billion people already live in places turning into desert, and soil is being lost between 10 and 100 times faster than it is forming.
- **Global warming**. Glaciers are melting, sea levels are rising, cloud forests are dying, and wildlife is scrambling to keep pace.
- **Migration of people**. The meteorological impact of climate change can be divided into two distinct drivers of migration; climate processes such as sea-level rise, salinization of agricultural land, desertification and growing water scarcity, and climate events such as flooding, storms and glacial lake outburst floods
- **Plant life and climate change**. Climate change affects the growth of plants in three ways. First, as CO2 levels increase, plants need less water to do photosynthesis. ... But a second effect counters that: A warming world means longer and warmer growing seasons, which gives plants more time to grow and consume water, drying the land.
- **Water resources**. The main climate change consequences related to water resources are increases in temperature, shifts in precipitation patterns and snow cover, and a likely increase in the frequency of flooding and droughts.
- **Wildlife and Climate Change.** Humans and wild animals face new challenges for survival because of climate change. More frequent and intense drought, storms, heat waves, rising sea levels, melting glaciers and warming oceans can directly harm animals, destroy the places they live, and wreak havoc on people's livelihoods and communities.

TOOLBOX

Inventory of skills teachers need to develop in order to be able to simplify the interdisciplinary and cross-curricular approach to the complex topic, and some techniques that can be used to present the topics to the children.

CLASS ACTIVITIES

Inventory of short and ready to use lessons or exercises, to be used independently or together with a subject in the curriculum, to make it easier for teachers to associate them to what they usually do in class. For example, music class can provide an opportunity to review environmental songs or a cycling trip combined with learning about the environmental impacts of transportation. In mother tongue and literature classes, students can read and write stories about the environment and launch citizen initiatives as an interdisciplinary learning project with visual arts.

INFOGRAPHICS

Prepared to introduce a climate change related topics to the class. They are meant for direct use with the children. They are a visual presentation of complicated topics, teachers can use to offer climate change related information in a nice and simple way. A teacher should read the full scientific background and then use this easy to understand representation of the same information to introduce the topic to the class, before a class activity.

ASSESSMENT

We offer a questionnaire for teachers that want to make sure they have understood all proposed topics and are now ready to use them in class.

FINAL CERTIFICATION

The certification is delivered only to registered users that completed the online final assessment.

The aim of the tools and materials offered are for teachers to

---

- Increase their ability to talk about complex topics and simplify them, while remaining faithful to the science
- Understand the complexity of climate change and being able to view it from different angles and perspective
- Learn how to connect climate change issues with other subjects taught in class

- Increase skills and abilities, needed to engage students to have them focus on these important topics
- Understand the "big picture" and ability for an holistic approach to issues related with climate change and their connection and impact on our everyday life
- Learn about new teaching methods for updating their skills for the benefit of their students, present and future

WHAT IS CLIMATE CHANGE?

In 2008, climate change was proclaimed by the UN Secretary-General, Ban Ki Moon, to be the defining challenge of our time (UNESCO, 2010, p. 2). Not long ago, it was treated more lightly. As recently as 2001 the UN Intergovernmental Panel on Climate Change (IPCC) more or less assumed, on evidence available at the time, **that climate change would be gradual and incremental**, and therefore manageable through progressive adjustments (IPCC, 2001). The Panel's tone was tentative.

By 2007, as further scientific data accumulated including evidence of positive feedback mechanisms that would amplify the warming of the planet and of abrupt, irreversible climate 'tipping points', IPCC was adopting a **firmly unequivocal and more urgent tone** (IPCC, 2007). As one observer put it: 'Climate change is coming faster and rougher than scientists have expected' (Romm, J.J., 2007). The 2007 IPCC report also reflected the emerging global consensus amongst scientists that climate change is predominantly human-induced (IPCC, 2007. p. 1).

It signalled the need for urgent and transformative action, local through global, to address the threat of potentially runaway climate change. Since then, our **understanding of the threat** has become much clearer with some scientists already concerned as to whether the global community can act decisively and quickly enough to stabilize the global surface temperature rise at 2.00C above pre-industrial levels which is generally regarded as being a liveable increase (Oxfam International, 2009).

In this difficult task, education has a crucial part to play. Its role is threefold. First, it has to play its part in building social and individual capacities and attitudes for climate change **mitigation** so as to pre-empt worst case climate change scenarios in the future. Second, it has the task of developing the skills, capacities and attitudes for **adaptation** in the face of already evident and looming climate impacts. Third, it has an on-going role to play in stimulating and reinforcing **understanding of and attentiveness** to the realities of climate change.

Why it is important to talk about Climate change?

As interdisciplinary issue, climate change can open young minds to deeper avenues of thought and reinforce learning in social science. It could confer onto students an appreciation of the role they play in their environment—both their physical, changing environment, and their civic environments. On the other hand, novel contexts such as climate change education require novel teaching methods and teachers need to be supported in acquiring and developing innovative teaching and assessment methods using climate change to increase all-around students' active citizens and transversal skill in students.

Teaching about climate change is by no means easy, it is a multi- and interdisciplinary problem closely linked to the natural and social sciences, morals and technology. Understanding and comprehending this complex topic can be difficult for anybody without solid scientific preparation.

The discussion on climate change is filled with a wide spectrum of viewpoints, some in direct opposition with one another. The nature of climate change education is such that complexity is at the science core, while teachers are required to simplify. It is a rich topic to explore in the classroom and it can be tackled starting from science and geography but also politics. It is an area with roots in a range of subjects and can be a great source for debate.

The fact that climate change may be viewed on local, regional, and international levels—not to mention through scientific, civic, and cultural lenses—provides students with the opportunity to develop critical analysis skills and ability synthesize information. Its cross disciplinary and complexity can be challenging for those who do not possess solid scientific background and a clear idea on a starting point.

At present, this is a small aspect of other science teaching, and teachers are required to change and support to provide effective teaching. Though interdisciplinary education requires more work, it also equips students for problems and discussions they'll face outside of the classroom (deniers of the phenomenon, misinformation, indifference, fear…).

Educators are required to ensure that the simplifications remain faithful to the science while not overwhelming the students. On the other hand, for some students (and their families), climate change science is seen as controversial, and makes it very distinct from other areas of science. It is not enough to simply teach students about the science behind climate change; students also need to learn how institutions and individuals deal with problems of this scale, and how they fit into that

larger picture. As long as schools have a responsibility to teach global citizenship and community stewardship, they have reason to teach about climate change.

Climate change education provides an important window into individual and societal responsibility, making it relevant for all partners involved and a global urgent matter. There is no need to mention global policies on the matter and the global movement to bring the topic a priority at any level and in any field. As educators, schools not only have an interest in teaching subjects that will prepare students for careers and earn them good test scores, but to teach them to be mindful citizens. Teaching on climate change means teaching on topics like environmental stewardship and collective responsibility—teaching students that they and those around them have a responsibility to something larger than themselves.

By promoting schools as learning organisations, both centralised and decentralised systems can encourage and enable teachers and school leaders to help shape pedagogy and refine current practice through local research and networking. Individual teachers, teaching teams, and entire schools are then less reliant on conventional hierarchies (waiting for change to be initiated from the top down). They are also in a better position to respond to rapid changes of policy and ever-higher quality expectations (The final report and thematic outputs of the ET2020 Working Group Schools).

Through the CC-EDU project, schools have an opportunity to teach their students to evaluate a variety of evidence and draw their own conclusions. If students are to leave school and tackle issues head-on, they can't do so without understanding how to use information and balance opposing viewpoints.

The possibility for offering more targeted support to help teachers develop competences, enhances the quality of teaching in general (School development and excellent teaching for a great start in life COM(2017) 248 final). A holistic, individualised and young-people-centred approach is crucial for keeping the interest of young people in any topic, on climate change in particular.

The activities and the learning experience offered, but most importantly the participated process and practical application of real cases and exposure to better quality education, will have a strong impact on the students in the targeted institutions.

Emphasis on self-transformation

The three dimensions of climate change education (**mitigation, adaptation, understanding**) need to underscore **self-transformation**, in recognition of the fact that neither the 'business as usual'

approach nor scientific and technological solutions will help global society avoid the worst effects of the warming of the planet. Each and every person has his or her own role to play. The three dimensions are complementary and as the learner works with and through them, they allow for the continued engagement and recurring reflection that is fundamental to transformation.

Focus on mitigation

Identifying climate change as human-induced begs the question: Which individual and collective behaviours and social and economic structures are causing the problem? The **mitigation dimension of climate change education** is about identifying the causes of climate change and developing the knowledge, skills and dispositions required for individual and societal change to rectify those causes. Taken at its most basic level, the root cause of climate change is greenhouse gas emissions. At this level, education for climate change mitigation covers the various levels and types of energy consumption, the shift to non-polluting, renewable energy sources, energy conservation, environmental conservation, reforestation and afforestation. Going deeper, mitigation education involves examining economic systems, social structures, cultural patterns, lifestyle expectations, consumerism, wealth distribution, aspirations and value systems and their causal relationships with greenhouse gas emissions.

Focus on adaptation

The **adaptation dimension of climate change education** relates to building resilience and reducing **vulnerability** in the face of climate change impacts that are already happening or are soon to happen. The learning may be of a technical nature, such as learning about drought resistant farming practices or flood management behaviours. It may go beyond the technical aspects to a profound re-thinking of cultural practices and traditions. The adaptation dimension aligns climate change education with **disaster risk reduction education** (education to build a **culture of safety and resilience** in the face of potential cataclysm).

Focus on understanding and attentiveness

The **understanding and attentiveness dimension** is about understanding what is happening to the climate, understanding the driving forces behind climate change, and creating a mind-set of alertness and mindfulness to changes that are already occurring. The climate change threat is huge and all-pervasive but, at the same time, stealthy and invisible, and is consequently easily put aside under day-to-day pressures of life. There are also widespread misconceptions about climate change circulating continually and, especially amongst populations of affluent societies, manifestations of 'eyes wide shut' denial and avoidance that need to be challenged (Hillman, M., Fawcett, T & Rajan, S.C., 2007).

Towards overall societal change

Learning programmes are required to help learners engage with the full seriousness of the climate change threat, search for new meanings and values, and move into personal and collective empowerment and action.

In sum, there is an underlying goal of self-transformation to climate change education for sustainable development. It is about affecting deep personal change within and through this, an overall societal transformation towards new ways of seeing the world, finding or rediscovering a sense of what we value, reshaping and reorienting aspirations and purposes, and envisioning markedly different futures. It is holistic education as a precursor to a new world view, and a securer and more sustainable future (Kagawa, F. & Selby, D. (Eds), 2010).

Building emotional intelligence

The prospect of a future marked by the consequences of climate change, such as loss of biodiversity, degradation of ecosystems and social consequences also suggests a more significant role for emotional intelligence in education for sustainable development than has so far been the case. Education for sustainable development educators have moved forward with fostering critical thinking, problem solving, solution-centred learning and change competencies, but they have made less progress on nurturing the emotional learning that connects with the beauty and diversity of the earth, its people and creatures and helps the learner feel the loss of diversity. Such learning can provide an emotional basis for purposeful social action to preserve what is valued into the future.

Local decisions have global implications

Climate change does not stop at national borders. It offers a vivid example of the interconnected global system in which we live. The energy and lifestyle decisions and behaviours of one part of the world can have serious implications for most if not all other parts of the world. For this reason climate change education for sustainable development includes a strong global dimension.

• Students everywhere need to know what other societies are doing (or not doing) that is exacerbating the warming of the planet.

• Students everywhere need to understand the global economic, social and political forces that drive the problem.

• Students everywhere need the inspirational stories of successful actions by groups and communities to mitigate or adapt to climate change.

• Students everywhere need to know what other young people are thinking and doing. This speaks for curricula, teaching and learning materials and media that enable a global and intercultural dialog to take place on climate change (Lotz-Sisitka, 2010, p. 71-88). The many voices and experiences of people from around the world need to be heard in the classroom.

Funded by the Erasmus+ Programme of the European Union

XXI CENTURY TEACHING METHODS

What Kind of Learning and Teaching Approaches does Climate Change Education for Sustainable Development call for?

Climate change is a matter of great complexity and uncertainty, involving interplay between climate, biophysical, environmental economic, social, cultural and political systems at all levels, personal through global, within past, present and future timeframes. Climate change education requires the learner to critically review their own and others' assumptions, perspectives and worldviews. Its pedagogy is, therefore to prepare learners to deal with uncertainty within complexity.

Inherent in the uncertainty is the idea of learning as open-ended process. There is no fixed and final destination to our learning - only learning that adjusts what we think before new learning comes along to bring a further shift in perception and understanding. Solutions are, thus, provisional adjustments in an ever-changing world (Pike & Selby, 1988, p. 35). Guidelines for facilitating such learning follow in Section 6 of this document.

Skills for open-ended learning

The skills learners need for open-ended learning that addresses climate change in relation to sustainable development fall under six headings:

• **Skills of information management**: receiving, expressing and presenting information; organizing and processing information, evaluating information.

• **Skills of critical thinking**: critically evaluating data; creative thinking; problem solving; making ethical judgments; decoding and deconstructing media messages; decision making; systemic/relational thinking; seeing the particular as part of the whole.

• **Skills of action**: change agency/advocacy; campaigning; involvement literacy (critical evaluation of action choices); adaptation/risk avoidance.

• **Skills of interaction**: consensus building and negotiation; assertiveness; listening; cooperation; conflict management; empathizing and demonstrating solidarity.

• **Futures-oriented skills**: envisioning; extrapolating; forecasting; backcasting (the ability to think backwards from a point in a desirable future).

• **Personal skills**: congruence (the ability to discern and act on inconsistencies between attitudes/values and actual behaviour); emotional coping; centring (harmonizing emotional, intellectual, physical and spiritual aspects of self); living simply.

The claim is not being made that these skills are original or particular to climate change education for sustainable development but rather that, brought together, they represent the skills that are essential to achieving its learning purposes.

Practical and diverse learning approaches

Climate change education for sustainable development has a strong practical orientation. It calls for hands-on engagement by the community in schools. Adult members of the community are often on campus and in the building helping with sustainability-related initiatives to enhance sustainability and better guard against future climate-induced hazard.

Climate change education for sustainable development is also marked by diversity of teaching and learning approaches. Teachers experiencing the Climate Change Teacher Education Course will find themselves working in many different ways that will draw upon and combine their intellectual, emotional and practical intelligence. Underpinning the course – and the classroom activities that will be presented – is the conviction that the interplay of intelligences offers the most potent springboard for transformative action (Pike & Selby, 1988, p. 47-60).

Climate Change Education for Sustainable Development also embraces systemic learning, in which understanding relationships is crucially important. Phenomena and events are not best understood by treating them separately but by seeing them in relationship to each other.

"…from a pedagogical viewpoint, climate change is uniquely challenging…climate change tests the capacity of education to organize learning around problems characterized by complex social dynamics, uncertain knowledge and risks."

The complexity and uncertainty of climate change cannot be approached very easily, save through systems thinking in which learners constantly ask 'What are the interconnections and interrelationships at play?' (Selby, 2007).

"The best teachers are those who show you where to look, but don't tell you what to see" - Alexandra K. Trenfor

The new century introduced significant changes in didactics and teaching methods. Pedagogy of the twentieth century differs from the pedagogy of **the twenty-first century**. Since the beginning of the twenty-first century, there have been many changes in the development of national and world education. In the twenty-first century, significant changes are occurring related to new scientific discoveries, informatization, and globalization, the development of astronautics, robotics, and artificial intelligence. This century is called the *age of digital technologies and knowledge*.

New teaching methodologies are changing the educational environments around the world and driving better academic performance among students. ***The biggest challenge for any teacher*** is ***capturing each student's attention***, and conveying ideas effectively enough to create a lasting impression. As a teacher, to tackle this challenge effectively, you should implement innovative ideas that make the classroom experience much more lovable for your students.

A number of different teaching techniques emerged due to this change in education. Many of these **teaching techniques** are not actually new! The **use of technology in the classroom** has simply given education a new lease of life allowing us to approach old ideas in new ways.

One of the best qualities a teacher can have is a willingness to **try new teaching strategies**! Effective teaching holds your students' attention so powerfully they will beg you to stay longer in class!

In Effective Teaching and Learning, educational researcher Naga Subramani argues that an effective teacher: "**Constantly renews** oneself as a professional on his [or her] quest to provide students with the highest quality of education possible. This teacher has no fear of learning new teaching strategies or incorporating new technologies into lessons." Is that you?

In **modern school**, we observe serious changes related to informatics and introduction of multimedia in the educational environment. Modern scientists— teachers, sociologists, futurists also reflect— speak about a new generation of students, that is, schoolchildren of the twenty-first century. Let us

consider the foreign studies of scientists who demonstrate modern changes and new approaches in the development of didactics.

Hietajärvi call the modern generation as a generation with “social and digital participation” and write that “social and digital technologies are integrated systems of technology, social media and the Internet that provide a constant and intensive online interaction with information, people, and artifacts”; social and digital participation is “a new concept of the practice of informal, socially-digital mediated participation”.

Teachers have diametrically opposed opinions on how to respond to changes: from conservative (leaving everything as it is, schoolchildren need to be taught as in the last century) until the need for a complete restructuring of the education system. Our position is based on the principle of ambivalence, the continuity of “tradition → innovation”, the need for active research of the phenomenon of electronic and visual culture and the study of the influence of visual culture on the personality of a student. Digital technologies change our way of life, ways of communication, way of thinking, feelings, channels of influence on other people, social skills, and social behaviour.

These issues put forward new requirements for the teacher and his/her professional activities. Teachers need to learn new information and digital technologies more actively. In addition, new research is needed in the field of the psychology of perception and thinking with the active use of e-learning. Practical training of teachers for the use of ICT and digital resources, the formation of digital literacy, the inclusion of such courses in educational programs for teachers is necessary nowadays.

Teaching Strategies and Methodologies

We go over some of the main innovative approaches that educators have forged over the last few years and that every **21st century teacher** should be acquainted with.

Classroom teaching strategies	Classroom management	Flexible seating
	Webb's depth of knowledge	Summative Assessment
	Active learning	Formative assessment
	Differentiated instruction	Personalized learning
	Universal design for learning	Response to intervention
	Classroom technology	

Math teaching strategies	Math games	Math websites
	Mental math	Common core math
	Solve math problems faster	How to teach multiplication
	Multiplication games	Multiplying fractions
	How to divide fractions	Math puzzle
	Math games	Math websites

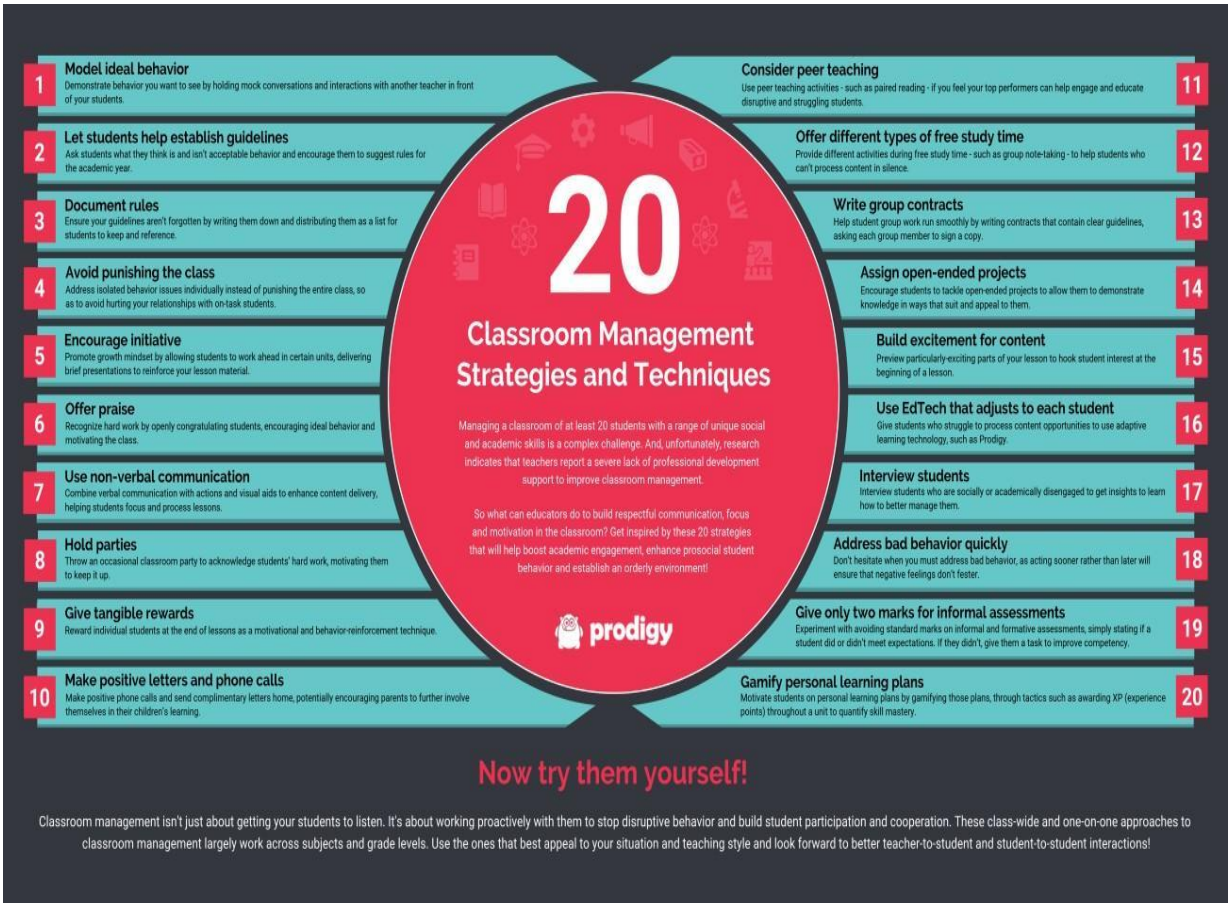
Student-focused teaching strategies	Gamification	Convergent and divergent thinking
	Project-based learning	Experiential learning
	Peer teaching	Inquiry-based learning
	Problem-based learning	Cooperative learning
	Reciprocal teaching	Blended learning
	Culturally responsive	Interdisciplinary teaching

Classroom management strategies

According to research from 2006, teachers overwhelmingly reported a lack of professional development support when it came to improving their own **classroom management strategies.** This can lead to confusion for students and frustration for teachers.

When students clearly understand what's expected of them, they're more likely to be focused and engaged with their lessons. Some tips for building a positive environment include:

- **Model ideal behavior**: Clearly explain proper behavior, and then follow it yourself.
- **Encourage initiative**: Allow students to actively participate in the learning process.
- **Avoid collective punishment**: While it can be difficult, make a point of calling out disruptive behaviours on an individual, not collective, basis.

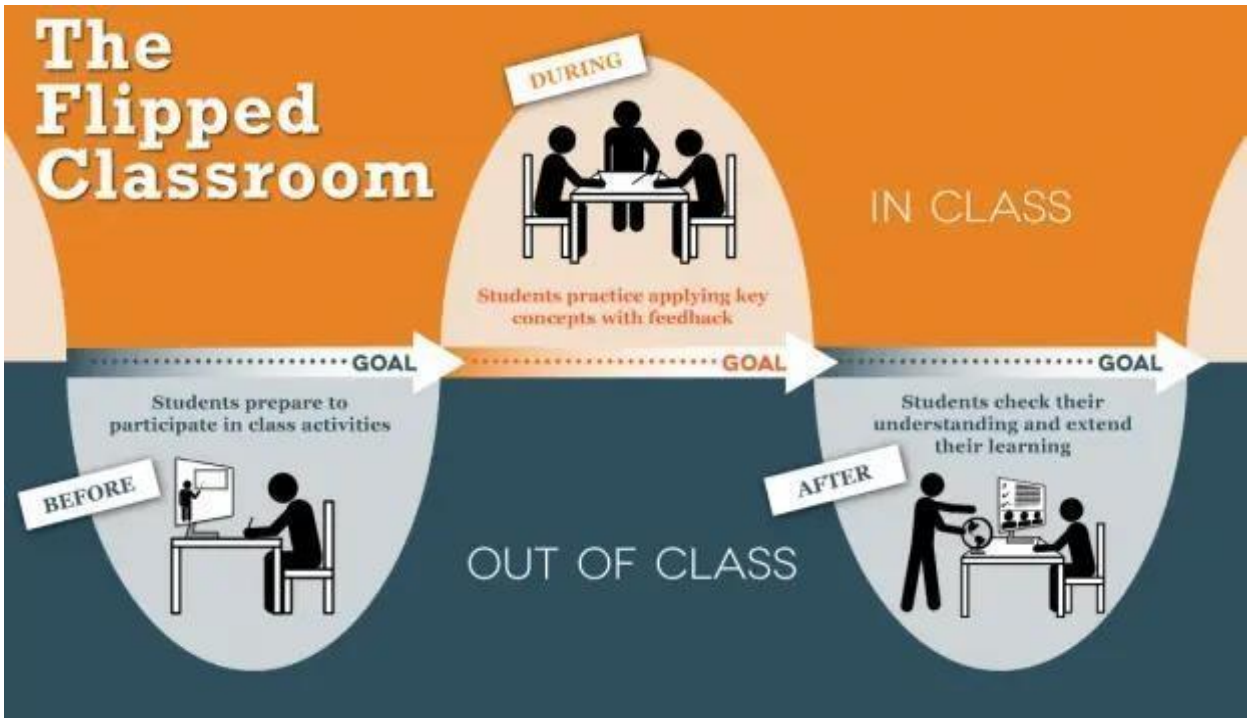


In the picture you can find the Infographic with **20 Classroom Management Strategies and Techniques**. *What can educators do to build a respectful communication, focus and motivation in the classroom?* **Get inspired by these 20 Strategies…**

FLIPPED CLASSROOM

One of the modern methodologies that has gained more popularity in recent years, Flipped Classroom is a pedagogical approach in which the traditional elements of the lesson taught by the

teacher are reversed – the primary educational materials are studied by the students at home and, then, worked on in the classroom.



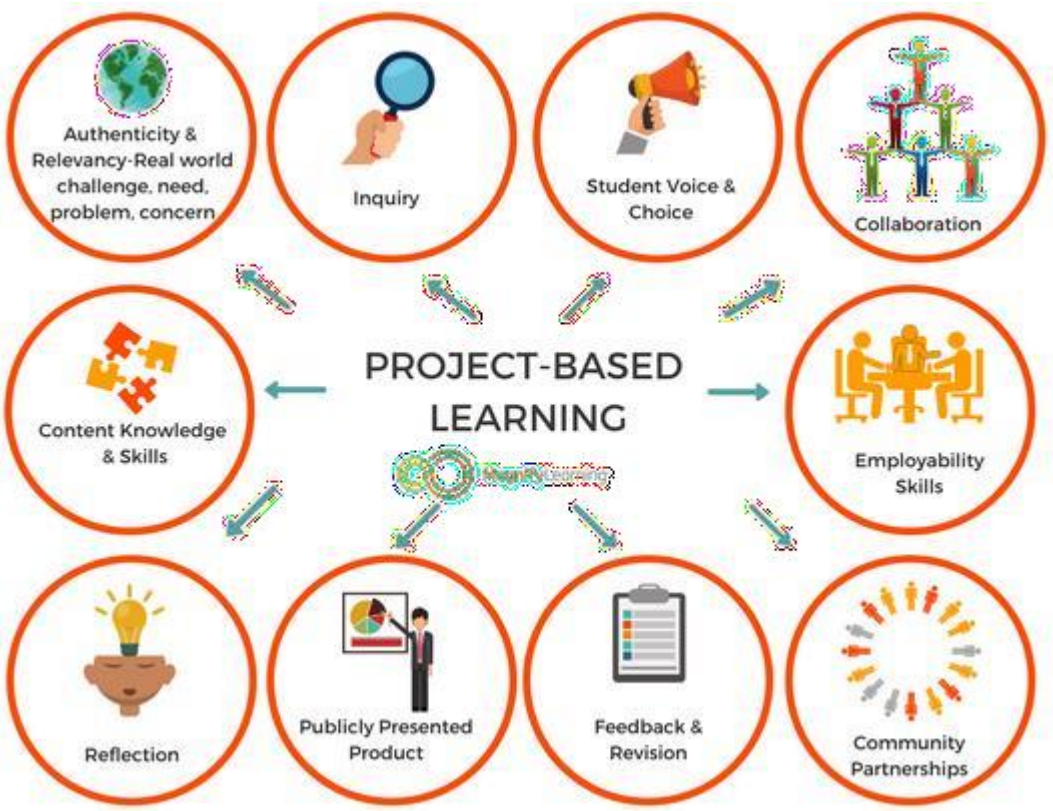
The Flipped Classroom Model basically involves **encouraging students to prepare the lesson before class**. Thus, the class becomes a dynamic environment in which students elaborate on what they have already studied. Students prepare a topic at home so that the class the next day can be devoted to answering any questions they have about the topic. This allows students to go beyond their normal boundaries and explore their natural curiosity.

The main objective of this methodology is to **optimize time in class** by dedicating it, for example, to meet the special needs of each individual student, develop cooperative projects or work on specific tasks.

PROJECT-BASED LEARNING

With the arrival of new information and communication technologies to schools, both **new teaching methodologies** as well as **new versions of existing methodologies**, now revised and updated for the digital generation, have emerged. One of the most used in class at present is Project-Based Learning (PBL).

In its essence, PBL allows students to acquire key knowledge and skills through the development of projects that respond to real-life problems.



"The teaching based on projects or integrated tasks, is today the best didactic guarantee for an effective development of key skills while also acquiring the knowledge of the curriculum's content."

Starting from a **concrete problem, instead of the traditional theoretical and abstract model**, sees notable improvements in students' ability to retain knowledge as well as the **opportunity to develop complex competencies such as critical thinking, communication, collaboration or problem solving.**

COOPERATIVE LEARNING

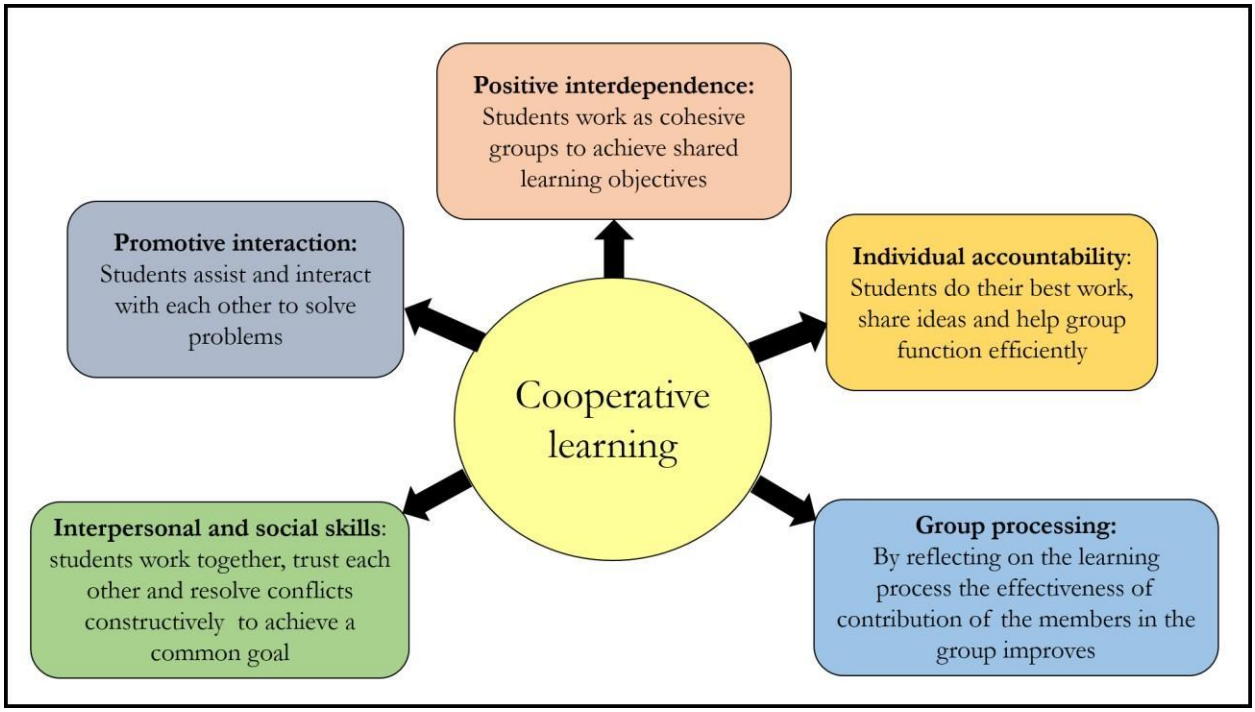
"Stronger together". This concept in a simple way cooperative learning, a methodology that teachers use to group students together and, thus, impact on learning in a positive way. The proponents of this model theorize that **working in a group improves the attention, involvement and acquisition of knowledge** by students.

The final goal is always group-oriented and will be achieved if each of the members successfully perform their tasks.

The main characteristic is that it is based on the formation of groups of 3-6 people, where **each member has a specific role** and to reach the objectives it is necessary to interact and work in a coordinated manner.

In a cooperative learning context, **the final goal is always common and will be achieved if each of the members successfully performs their tasks.** On the other hand, individual learning has students focusing on achieving their objectives without having to depend on the rest of their classmates.

PROBLEM-BASED LEARNING



Problem-Based Learning (PBL) is a **cyclic learning process** composed of many different stages, starting with asking questions and acquiring knowledge that, in turn, leads to more questions in a growing complexity cycle.

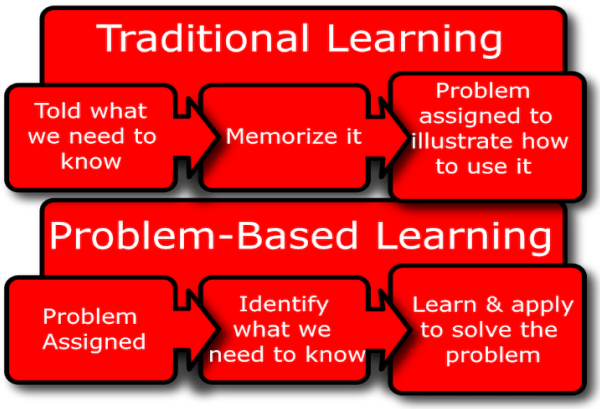
Putting this methodology into practice does not only mean the exercise of inquiry by students, but convert it into useful data and information. According to *several educators,* the four great advantages observed with the use of this methodology are:

- The development of **critical thinking and creative skills**
- The improvement of **problem-solving abilities**
- Increased student **motivation**
- Better **knowledge sharing** in challenging situations

DESIGN THINKING

Education has always been a **prolific space for innovation.** Teachers all over the world are constantly coming up with **new ideas and methodologies** to introduce in the classroom making the best of the tools at their disposal.

Design Thinking (DT) applied stems from industrial designers and their unique method to solve



problems and satisfy the needs of their clients. Applied to education, this model makes possible to **identify with greater accuracy the individual problems of each student** and generate in their educational experience the **creation and innovation towards the satisfaction of others,** which then becomes symbiotic.

THINKING-BASED LEARNING

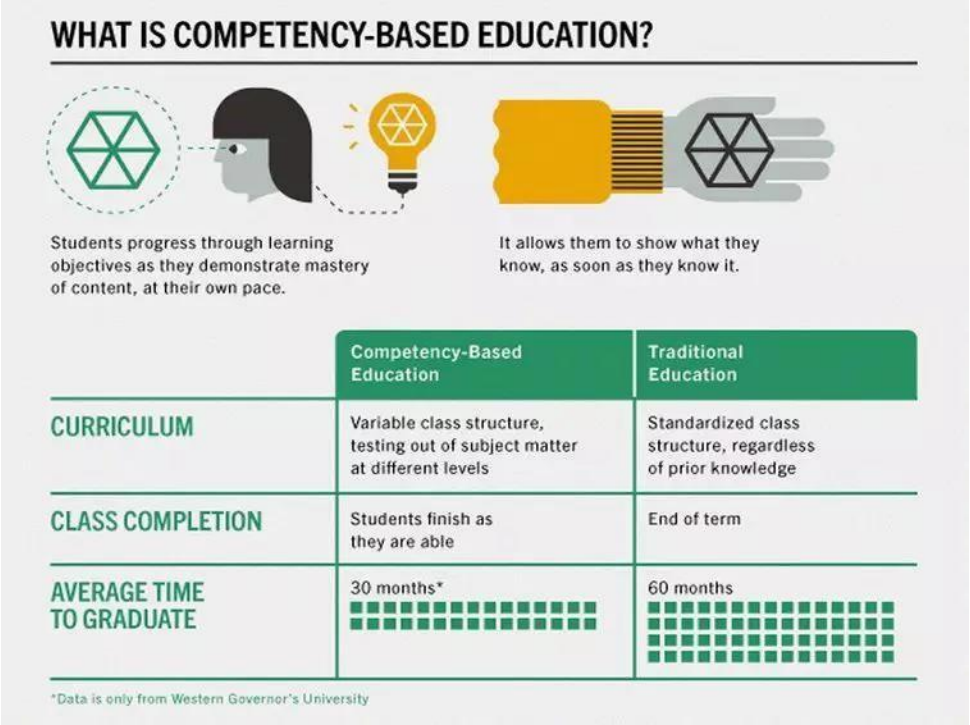
Beyond the **debate around the effectiveness of learning by memorizing** facts and data when discussing education, one of the most talked about aspects is the need to show students how to work with the information they receive at school. Teach them to contextualize, analyse, relate, argue… In short, convert information into knowledge.

This is the goal of **Thinking-Based Learning (TBL),** developing **thinking skills beyond memorization** and, in doing so, developing effective thinking on part of the students.

COMPETENCY-BASED LEARNING

By definition**, all learning methodologies have the acquisition of knowledge, the development of skills and the establishment of work habits as their main goals.** Competency-Based Learning (CBL) represents a set of strategies to achieve this.

Through assessment tools such as rubrics, teachers can go through the academic curriculum without significant deviations but focusing it in a different way, putting into practice real examples and, thus, transmitting to their students a more **tangible dimension of the lessons**.



CHALLENGE BASED LEARNING

Challenge Based Learning (CBL) provides an efficient and effective framework for learning while solving real-world challenges. The framework fuels collaboration between students, teachers, families, and community members to identify big ideas, ask thoughtful questions, and identify, investigate and solve challenges. This approach helps students gain deep subject area knowledge and develop the skills necessary to thrive in an ever-changing world.

Funded by the Erasmus+ Programme of the European Union

TEACHING CLIMATE CHANGE

Understanding the ethical perspective

According to the Global Humanitarian Forum report of 2009, the 'silent crisis' of climate change is already causing on average, 300,000 deaths per year, seriously affecting 325 million people with a further 4 billion people vulnerable (Global Humanitarian Forum, 2009, p. 1). Learning about climate justice encompasses the issues and ethical dilemmas surrounding the injustice of climate change impacts, which fall disproportionately on the people in the developing countries even though they are least responsible for the GHG emissions contributing to climate change. It also calls for debate and discussion on the questions of whether, to what extent, to whom, and in what ways the developed countries should offer restitution and compensation for their polluting of the atmosphere – a global resource that all countries share. As climate change migration increasingly happens, learning about climate justice extends to the consideration of climate refugees and their rights and privileges within host countries.

Ultimately, 'local' and 'global' are faulty categorizations because global events or trends by definition affect all localities, and a local event can feed into global developments. The distinction is nonetheless a useful one to maintain. Locally focused climate change education allows for engagement with practical, concrete issues and initiatives. A global focus guards against a tunnel-vision approach to climate change education that would, for example, have students in the North not being taught about climate justice issues in the South.

The futures dimension connected with climate change learning

Sustainable development has long been defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1987, p. 43). In the definition is a clear recognition of the responsibilities of those alive today to generations to come through what is referred to as intergenerational accountability or intergenerational justice. The 'sustainable' element of "sustainable development" is about ensuring that future generations can enjoy at least the same level of opportunity for a fulfilling life as present generations.

Applying current knowledge to steer toward a sustainable future

From its inception, Education for Sustainable Development has asked that the three-way dynamic between **past, present and future** be given full representation in learning programmes. Implicit in this call has been a critique of a traditional 'rear view mirror' curriculum in which learners are encouraged to look backwards into the past as the best way of making sense of the present without ever studying the present in any depth and with little or no consideration of the likely impact of the present on the future. In contrast, a sustainability-oriented curriculum focuses upon the co-creating and co-evolving dynamic that exists between past, present and future. The past lights up our understanding of the present and of possible future directions. The choices, decisions and priorities of the present shape the future and also influence what we take from the past and teach as 'history'. Images and visions of the future shape what we do and decide now, and also how we view the past (Pike & Selby, 1988).

As understanding of climate change has deepened, so has appreciation of the importance of addressing sustainable futures. We have become aware of the closing window of opportunity to limit climate change before the amplifying and incontrollable effects of climate tipping points set in. We recognize now that the effects of global climate change we are now experiencing are the deferred impact of CO_2 emissions from some time in the past, and that our present-day emissions will have delayed but mounting consequences for future generations. We must also recognize that to choose the convenience of doing nothing or making ineffectual gestures goes against the grain of the intuitive desire to build for a better future.

Futures-oriented learning involves exploring probable, feasible and preferred futures (respectively, futures that are likely to come about given present trends, futures that might conceivably come about, and futures that we would like to see realized given our values and priorities). It is also about identifying and seeking to achieve desired futures while identifying and acting to avoid undesired futures (Pike & Selby, 1988).

Through what Curriculum Frameworks is Climate Change best taught and learned?

Concerned with helping learners understand the interplay between environmental, economic and social sustainability, Education for Sustainable Development has from the outset called for **multi-disciplinary and interdisciplinary frameworks** for programme delivery. The holistic concept of sustainable development is not helpfully contained within the confines of a particular subject or discipline. No one subject or specialist area can illustrate all the dimensions that are likely to come into play as learners consider sustainability concepts. Exploring environmental, economic and social dimensions will inevitably lead into consideration of cultural, ethical, philosophical, political, scientific, spiritual and technological factors. The breadth of the sustainability agenda presents real, but achievable, challenges to teachers.

Going beyond the science

How should sustainability issues be integrated into the curriculum in concrete terms? One commonly employed approach is to seek out opportunities to infuse sustainability-related concepts, issues and cases into discipline-based programmes (Selby, 2006, p. 57-59). While it is clear that science has the lead role in helping explain the climatology and physical science of global warming, a re-balancing away from the biophysical science curriculum and towards the social sciences is needed if the breadth and depth of the climate change threat are to be understood by learners. For example, a science teacher might explore the chemistry of the impact, clean up and disposal of oil spills at sea at an appropriate point in the curriculum while the social studies teacher might address the ethics of oil-based consumerism as the opportunity presents itself. The infusion of sustainability across the curriculum at each grade level can be charted and the cumulative student exposure to sustainability understanding and ethics can be monitored. The more thoroughly this is done, the closer the approach comes to an interdisciplinary approach whereby all subjects are contributing insights on sustainability through their own disciplinary lens.

Presenting the physical causes of climate change, including the accumulation of CO_2 and other heat trapping gases in the atmosphere, as well as how to reduce greenhouse gas emissions are topics primarily for the science (and technology) curriculum. Other forces implicated in the climate change crisis, such as the predominant economic paradigm, current development models, and the view that nature exists to be exploited in the interest of human consumption and consumerism, call for climate change to be addressed in curriculum spaces where ethical issues are treated, including social sciences, languages, and creative arts.

The wide-ranging impacts of climate change also call for cross-curricular treatment: new threats to the health of people, animals and plants as diseases migrate; the threat to cultural heritage and indigenous lifestyles through sea incursions, seasonally recurring wildfire and desertification; increasing hunger and malnutrition as the land becomes arid; massive internal and external population displacement with the threat of discrimination towards incoming people; destabilization of economies; threats to peace and security; increasing climate injustice globally; differential impacts on males and females thereby deepening existing gender inequalities, to name only a few.

Challenges for teachers

There are a lot of different roles in education, requiring different skills. Here, we look at the Key Skills you need to develop to talk about climate change to your students.

In the context of climate change, there is often a need to reconsider or adjust existing approaches to education, especially their potential to provide learners with the necessary knowledge and training to help them respond to a diverse and rapidly changing world.

To ensure effective learning and deep understanding of the subject matter, climate change education should be integrated across school curricula and specific activities have to be developed and tailored according to age, school type and level as well as contexts and particular needs.

The material will help the teachers discuss and understand how to deal with some of the many challenging issues.

CLIMATE CHANGE IS AFFECTING OUR MENTAL WELLBEING

Worry about climate change is affecting more people as global warming becomes more apparent around the world. But there is a solution that can help improve this anxiety and slow climate breakdown at the same time, writes Christine Ro.

Climate change impact our mental wellbeing in a number of ways. From trauma and stress following disasters, to relationship damage caused by separation and displacement, the psychological effects of climate change can be enduring. Of course, these effects are heightened for certain vulnerable populations, such as elderly and low-income people, as well as those on the frontlines of climate change.

But even people whose lives and livelihoods don't depend directly on the climate can feel the psychological strain. As noted in a report by psychology professor Susan Clayton at the College of Wooster and colleagues, "the ability to process information and make decisions without being disabled by extreme emotional responses is threatened by climate change".

So the first step is to acknowledge the validity of these feelings. The job of a climate psychologist is then to ask: "How can we support you to make this part of your life and not all of your life?" Hickman might encourage patients to join an activist group, or a discussion and support groups like a climate cafe.

Climate anxiety – like climate depression or climate rage – isn't a pathology. It's a reasonable and healthy response to an existential threat

In one study of a programme called Carbon Conversations, which involves group discussion and activity to reduce climate impacts, half of participants said that the programme helped them face their worries about climate change. And greater emotional engagement was associated with more change in habits. This showed the linked benefits of feeling part of a community, reckoning with difficult feelings, and taking constructive measures.

This kind of research has been put into practice at New York University's Environmental Health Clinic, which prescribes climate-friendly actions and group activities to its visitors. "There's less space for anxiety emotionally when you take practical steps," Hickman notes.

This is true even for extreme feelings. Hickman has counselled parents who fantasise about killing their children, out of fear of the climate-ravaged future. But she calmly points out that history is rife with examples of parents preparing to end their children's lives in order to protect them. "If we disallow those feelings, we're just driving them back into the unconscious," Hickman argues.

The parents who confess these dark thoughts to her aren't actually going to act on them, she believes, and it's important for them to have a safe, shame-free mental space to express the depth of their anxiety. Psychotherapy and other psychology tools can help people become more comfortable with the uncertainty that is inevitable when it comes to climate change.

For parents, anxiety about climate change can raise difficult questions about their children's future

"When we're scared, we can freeze," points out Susan M. Koger, a psychology professor at Willamette University in Oregon, who teaches and writes about psychology for sustainability. "We can become paralysed by fear, or just tune out. We use various kinds of defence mechanisms to distract, to deflect, to numb out." This kind of **"psychic numbing"** is unhelpful, both in dealing with the climate crisis and more generally. Also unhelpful is the guilt that I'm prone to. Koger says, "Guilt is not a useful emotion because guilt is not motivating. But instead of guilt, we can reframe it as responsibility."

A USA federal report that tapped psychologists' expertise outlines the ways climate change affects us all.

People's anxiety and distress about the implications of climate change are undermining mental health and well-being, according to a new federal report reviewing existing research on the topic. Issued by the U.S. Global Change Research Program, the report is the first time the federally mandated group has published an assessment solely focused on climate change and health.

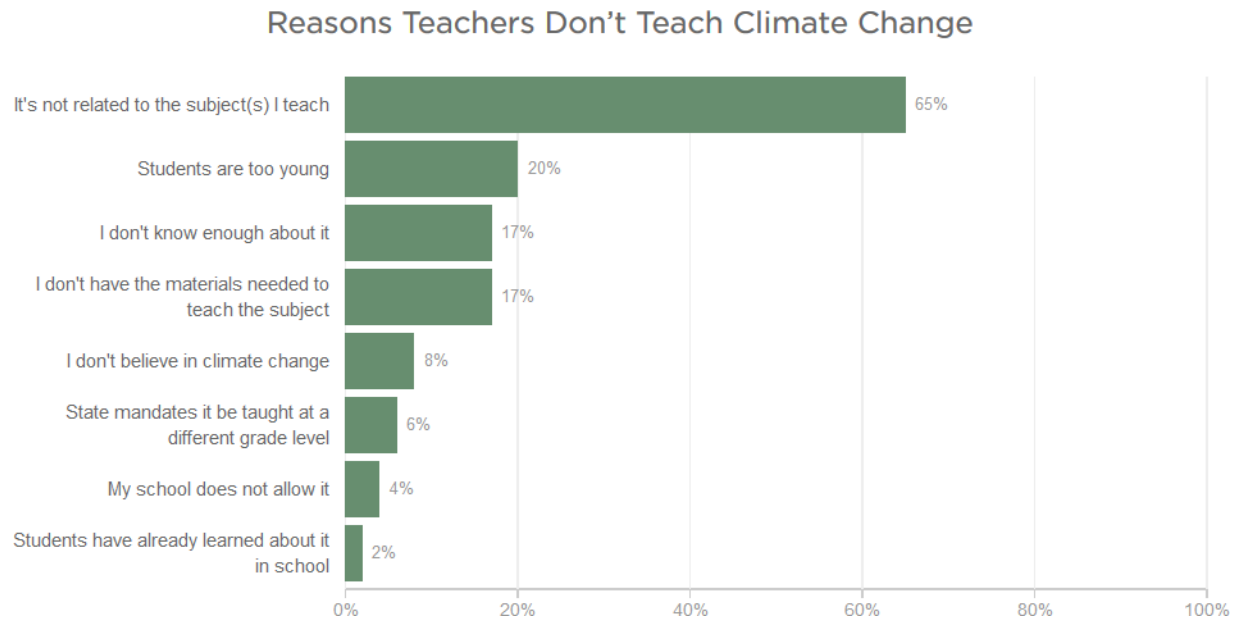
The report is notable for another reason, too: It contains a chapter devoted to mental health and well-being, a significant step forward for an assessment of this type, says lead author Daniel Dodgen, PhD, a clinical psychologist at the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response. "I think people realize that if you're going to talk about health, you have to talk about mental health," he says.

The report also found that:

- Exposure to climate and weather-related natural disasters can result in mental health consequences such as anxiety, depression and post-traumatic stress disorder. A significant proportion of people affected by those events develop chronic psychological dysfunction.
- Some people are at higher risk for mental health consequences from weather-related disasters. Among them are children, pregnant and postpartum women, people with pre-existing mental illness, people who are economically disadvantaged, those who are homeless and first responders to the disaster.
- Representations of climate change in the media and popular culture can also influence a person's stress response and mental well-being.
- Extreme heat increases both physical and mental health problems in people with mental illness, raising the risk of disease and death.

HOW TO TEACH CLIMATE CHANGE WITHOUT PANICKING YOUR STUDENTS?

Climate change is one of the most important challenges faced by current and future generations. The top reason that teachers say for not covering climate change? **"It's not related to the subjects I teach,"**



That raises the question: **Where does climate change belong in the curriculum, anyway? -** Joseph Henderson teaches in the environmental studies department at Paul Smith's College in upstate New York. He studies how climate change is taught in schools and believes it needs to be taught across many subjects.

"For so long this has been seen as an issue that is solely within the domain of science," he says. "There needs to be a greater engagement across disciplines, particularly looking at the social dimensions," such as the displacement of populations by natural disasters.

It's a difficult topic to talk about, let alone teach. Climate change can make children feel **scared and powerless**, so it's important to approach any conversation with care.

However, teaching about climate change can prepare students for the future. Here's how to introduce this topic in your classroom and incorporate it into lessons across history, science, social studies and more.

HOW TO TALK ABOUT CLIMATE CHANGE IN AN EMOTIONALLY INTELLIGENT WAY?

Climate change may be divisive, but that doesn't mean you should avoid it. Here's how to approach the topic effectively. Simply look at the reaction environmental activist Greta Thunberg received after speaking at the Climate Action Summit at the United Nations (or really, when she does anything) and you'll see how heated things can get when people talk about climate change.

"The issue is that people's positions on climate change—or any divisive topic, like abortion or trophy hunting—are based in their values and beliefs, which are tightly bound to their emotions," says Nardia Haigh, associate professor of management at the University of Massachusetts Boston. "Attacking someone will likely only escalate the things."

The overwhelming wealth of scientific evidence can make this topic feel even more polarizing, says Emma Frances Bloomfield, assistant professor of communication studies at University of Nevada, Las Vegas. "People can be confident that it's true, but that confidence can be interpreted as arrogance or patronizing, which can lead to sceptics feeling isolated and silenced," she says.

Introduce the topic

Instead of pulling out a soapbox, use current events, such as extreme weather or the elections, as a gentle transition into a conversation about climate change. This can be done, as an example during parent and teachers meeting in case a students offered resistance on the CC related topics and you as a teacher need to investigate a bit deeper on the reasons for that behaviour or resistance.

Measure their resistance

Understanding the source of the denial can help you better craft a conversation, says Bloomfield. There are several reasons why someone may dismiss climate change. For example, the person may not trust climate scientists.

Treat the conversation as a dialogue

Have a conversation with mutual respect. “You can disagree, but enter the conversation understanding the intrinsic value with the person you’re talking with,” says Bloomfield. “It’s a dialogue, not a lecture to tell them what they don’t know. You may find that you agree on common points.” If you’re met with resistance, inquisitively ask why they think the way they do. “You can say, ‘Tell me what you think about the environment,'” says Bloomfield. “Some people who are admittedly deniers or sceptics still care about the environment. If you go into the conversation assuming they don’t care about science or the environment you put yourself at a disadvantage and the conversation at a rocky start.”

Connect to their values

Most likely you are having this conversation with a colleague or the parents of your students. Not with pure strangers, in any way. So, you can probably already know a lot about the person that you’re engaging with, says Bloomfield. “Draw on those previous experiences—what do you already know about this person?” she asks. “Go into the conversation with a knowledge-gaining mind-set, rather than a persuasive goal.” Meet people at their values instead of their position, suggests Haigh. “To do this you need to make an effort to understand their values relating to climate change,” she says. “Take a leaf out of Socrates’ book and ask them questions about what climate change means to them personally or professionally, then listen, and ask follow-up questions.”

Understand the person’s need for security

When people argue topics for which they are passionate, their motivation is less about getting to the truth and more about what psychologist and emotional intelligence specialist George Kohlreiser calls a “secure base,” says Smith. “Put simply, this secure base is a sense of protection and fulfillment that comes with certainty and is a major human need regarding human well-being,” he says. “When a belief is challenged, a person may feel like he or she is being threatened, and an argument about climate change becomes a defense of one’s emotional and psychological well-being.” Emotional and cognitive empathy are imperative, says Smith. “Trying to understand why a person thinks the way he or she thinks is not only a caring thing to do; it will assist a person in gauging a situation accurately and speaking accordingly,” he says. “Don’t just wait for the other person to stop talking so that you can have your turn to make your excellent point. Truly listen to the other person to better discern what you need to say and how you need to say it.”

Set boundaries

If the discussion is met with resistance or if the other person wants to argue, state that you only want to have the conversion if it’s under mutual respect. “Give the person trust and respect, but if they’re

not giving it back to you, you don't want to continue," says Bloomfield. "The most graceful way to exit a conversation is to not match them; don't get angry, and don't get aggressive." Instead, let the person know the rules to which you want to adhere. "The other person can be responsible for ending the conversation if they violate the rules," says Bloomfield. "It only serves to show how reasonable and rational you are. You want to have conversation, not a screaming match."

Moving forward

Having diverse views in any society is a good thing, and they are important for democracy, says Haigh. "Opposing views help you build rigor," she says. "They make you do your homework to ensure you know the foundations of your own views, so you can either defend them better, or update them if needed." Bloomfield hopes more people are open to having climate conversations. "If we're having more conversations about it, more people may start to listen. Maybe you'll meet with people who are combative, but I'm surprised more often than not that people are open to these conversations, and that makes me very optimistic."

HOW CAN I COMMUNICATE EFFECTIVELY WITH MY STUDENTS IN CLASS?

A huge part of teaching climate change is communicating information. It might be **verbal**, **written**, or via any other route from **practical demonstrations to artistic interpretation** – whatever gets your point across.

Confidence helps you when you're standing up and directing a class. A lot of education sector jobs involve **public speaking**, so confidence is a must.

Researcher shows that students perceive teachers as more effective when teachers *listen* to what they have to say. Listening helps build positive relationships and studies clearly identify that close teacher and student relationships have a positive effect on academic success as well as social and emotional learning.

How to implement it:

- Use a **tone** that is **honest and tactful**, choosing words that are appropriate to the situation and non-inflammatory.
- When taking on a listening role, make **eye contact** and focus on the speaker.

- **Speak in turn, listen to each other**, never interrupting the speaker. Teachers who model respect with their students have more respectful classrooms overall because students learn how to communicate respectfully and see its effectiveness.
- Remember: your students will listen to you AFTER they feel listened to. **Listen to their opinions,** they will also guide you in focusing on the issues that are hardest for them.
- **Repeat** your message in different ways.
- **Check for Understanding**: Students can write down one sentence that summarizes what they think the lesson or lecture was about, or they can write a question they have about the lesson.
- Everyone communicates nonverbally through **facial expressions** and **gestures**. Effective communication in the classroom requires careful use of these nonverbal cues. A teacher who rolls her eyes at a student's question sends a louder message than her careful and expert verbal response.
- Gestures and animated facial expressions also give weight and **enthusiasm** to what a teacher has to say. Students who see a teacher actively engaged in what she is teaching will be much more engaged themselves.

HOW CAN TEACHERS CREATE HOPE INSTEAD OF ANXIETY?

Because of its large scale and complexity, climate change tends to cause *anxiety* also in adults. Children and young people are good at sensing adults' state of mind and draw their own conclusions. While scientific knowledge on climate change and its impacts is getting more and more accurate and in the face of the media presenting the topic in a threatening light, teachers should stay positive and keep **hope** alive.

Although future generations have to cope with climate change, the consequences don't have to be severe if we take **prompt action**. A growing number of people are constantly joining the fight against global warming. Remember not only to talk about the problems but also about **solutions and mitigation**.

On one hand, teachers have to be **sensitive** and **prepared** to deliver the contents, on the other, students have to be **aware** and develop skills to contribute to solve the situation.

How to implement it:

- Listening helps **recognize how children feel** about climate change.
- **Take emotions seriously**, whatever they may be, and encourage children to ***process*** them.
- **Creative methods** in music, drama, and the visual arts to facilitate processing emotions.
- **Creative physical activities** can be useful ways to vent fear, anxiety and insecurity.
- Stay positive.
- Tell them that **climate change can be slowed down** significantly enough that harmful impacts on humans and the environment are not insurmountable.
- After exploring climate issues together, **check the mood** in the classroom. Try to stay positive and encouraging.
- Focus on what can be done.
- Bring positive examples.
- **Be their example**: if you suggest simple everyday behavior, show that you are the first to adopt them, make them want to imitate you.
- **Motivate** your students.
- **Your enthusiasm is contagious.** If you believe in what you say, you will be able to engage the people you teach with your **positivity**.

Funded by the Erasmus+ Programme of the European Union

RESOURCES FOR TEACHING CLIMATE CHANGE

The best way to teach about a challenging topic is to find the right resources and examples for doing so. When it comes to climate change, there are a wealth of websites and lesson plans available to educate elementary students about this topic.

One example is **Climate Kids** from **NASA**. This project spans topics on **water, energy, plants and animals, atmosphere and weather and climate**. Another reputable resource is the National Center for Science Education. **Minda Berbeco**, director of the San Francisco Bay Chapter Sierra Club, says teaching young children about climate change isn't a political issue. Rather, she explains that it's a science topic with societal implications. She also says that today's teachers have no choice but to educate students on these matters.

"The data is readily available; we know Earth is warming. If children understand why, they can begin working towards slowing down the effects. Their future quality of life depends on it."

Additional lesson plan resources are shared by Common Sense Education senior editor **Danny Wagner.** He points out that *understanding climate change isn't just an ethical issue — it's now part of the Next Generation Science Standards*. This means that students will need to be able to explain how climate change occurs and what contributes to it. Wagner provides four digital tools and accompanying lesson plans that can be used in the classroom to advance climate change learning.

Teachers might also refer to the **National Ocean Service's Planet Stewards Education Project (PSEP).** Teachers who feel uncertain about teaching climate change topics will find this to be a useful resource for educating both themselves and their students. PSEP has also sponsored numerous environmental stewardship projects in elementary schools.

Younger students can also benefit from watching climate change videos that make scientific processes more digestible. A number of videos are collected by **Project Learning Tree.** These videos feature animals and easy-to-understand visuals. They're used to explain things like the carbon cycle, climate science and **biology topics** like how trees store and capture carbon.

Funded by the Erasmus+ Programme of the European Union

Connect climate change to the Real World

Incorporating visuals and real-world information into climate change lessons can help students better grasp the extent of the problem. According to the **National Education Association,** a real-world connection is crucial for properly teaching climate change.

> ***"One of the essential principles of teaching climate change to students is the message that it has consequences for the earth and human lives."***

A great place to start is asking students to consider how their daily actions might contribute to climate change. **Climate Change Connection** is a Manitoba- based resource that helps educate the public about climate change. They also have specific resources to engage and inform teachers, students and schools in taking action on climate change. One of their free resources for students is a carbon footprint worksheet. This asks students questions about transportation, housing and eating habits to help them better understand how their daily activities affect the planet. They also have an ecological footprint, which is a positive spin on the carbon footprint activity. This lesson helps students conduct self-assessments to see what good is being done for the environment.

Teaching students these real-world connections can also be done through activities. For example, sixth grade teacher **Melissa Lau** uses dice to teach her students how probability affects extreme weather. Some of these dice have extra sides, which symbolize additional carbon in the atmosphere.

> ***"The students then sent the dice clattering again and again across tables to test the extent to which the extra carbon contributed over time to high tallies, which indicated extreme weather events."***

While this is in a middle school classroom, the same activity could be used by fourth or fifth grade students as well. Lau also collects data from her travels to provide them with real-world information on how climate change affects other areas. After a trip to Alaska, for example, she showed students measurements and photographs of the impacts of climate change. This shows students that climate change is a real and current problem, even if they can't see the influence in their hometown.

Inspire Change and Action

Learning about climate change can be stressful, especially if students feel that nothing can be done to help. That's why it's important for teachers to pair elementary climate change lessons with actionable, hands-on activities that **cultivate compassion**. This will empower and inspire students to make a difference in their daily lives. For younger elementary students, start by spending time outside and teaching students about the local environment.

"Understanding that humans have impacts on the natural world and that wildlife is impacted by changing ecosystems is a must in grades K-2. Spending time exploring local wildlife/habitats and learning about any current risks will establish the ground-work for more abstract climate-related thinking later on," says Lindsey Bailey, teacher training manager at Population Education.

For every lesson that focuses on a problem or challenge related to climate change, consider adding a positive and actionable point. "An elementary school child can understand why it's better to walk to their friend's house instead of being driven, or why they can wear a sweater in the house instead of just cranking up the heat," says pediatrician Samantha Ahdoot, lead author of the American Academy of Pediatrics' Policy Statement on Climate Change and Children's Health, by way of example.

Consider encouraging small daily changes that can make students feel empowered about making a difference. "My goal is to inspire students, not scare them to death! I stress that we can do something about this. It's very much empowering," says climate change education consultant Kottie Christie-Blick.

She facilitates a website called **Kids Against Climate Change**, which explains why the world's climate is changing and encourages and empowers students to get involved in things like recycling and reducing air pollution.

We also heard from teachers who say that they are searching for more ideas and resources to take on the topic of climate change. Here are some thoughts about how to broach the subject with students, **no matter what subject you teach**:

DO A LAB Lab activities can be one of the most effective ways to show children how global warming works on an accessible scale. You can use the class activities we offer in the resources section

SHOW A MOVIE or short videos on the topic. Check the Class activity section for some videos or check the resources at the end of this guide for more.

READ A NOVEL by reading it, kids made connections between what is happening today and the novel. At the end of the chapter, as a culminating project, students in groups, could research current solutions for issues presented. The best practices and positive example section can be useful to this end.

DO CITIZEN SCIENCE - Terry Reed is the self-proclaimed "science guru" for seventh-graders at Prince David Kawananakoa Middle School in Honolulu. He has also spent a year sailing the Caribbean, and on his way, he collected water samples on behalf of a group called **Adventure Scientists**, to be tested for micro plastics. (Spoiler: Even on remote, pristine beaches, all the samples

had some). He has assigned his students to collect water samples from beaches near their homes to submit for the same project. He also has them take pictures of cloud formations and measure temperatures, to see changes in weather patterns over time. "One thing I stress to them, that in the next few years, they will become the voting public," he says. "They need to be aware of the science."

ASSIGN A RESEARCH PROJECT, MULTIMEDIA PRESENTATION OR SPEECH - Gay Collins teaches public speaking at Waterford High School in Waterford, Conn. She is interested in "civil discourse" as a tool for problem-solving, so she encourages her students "to shape their speeches around critical topics, like the use **of plastics, minimalism, and other environmental issues."**

TALK ABOUT YOUR PERSONAL EXPERIENCE - Pamela Tarango teaches third grade at the Downtown Elementary School in Bakersfield, Calif. She tells her students about how the weather has changed there in her lifetime, getting hotter and drier: "In our Central Valley California city of Bakersfield, there has been a change in the winter climate. I told them about how, when I was growing up in the 1970s, we often had several two-and-three-hour delays to school starting because of dense tule fog, which affected visibility. We really never have those delays in the metropolitan area. It is only the outlying areas, which still have two-and-three-hour dense fog delays, and they are rare even for the rural areas."

DO A SERVICE PROJECT - "I teach pre-schoolers and use the environment and our natural resources to highlight our everyday life," says Mercy Peña- Alevizos, who teaches at Holy Trinity Academy in Phoenix. "I stress the importance of appreciation and eliminating waste. My students understand and have fantastic ideas. We recycle and pick up around our neighbourhood." Environmental service projects can be simple, elaborate or just for fun. Check out the **#Trashtag challenge** on social media, for example.

START OR WORK IN A SCHOOL GARDEN - Mairs Ryan teaches science at St. Gregory the Great Catholic School in San Diego. "The sixth-graders oversee the school garden, as well as our vermin composting bin, christened the 'Worm Hotel'. The garden is their lab and the students 'live and learn' soil carbon sequestration and regenerative agriculture. Our school's compost bin is evidence that alternatives exist to methane-producing landfills. In looking for more solutions to reduce methane, students debate food reuse practices around the world."

Here you can find some more resources on climate change

Alliance for Climate Education has a multimedia resource called Our Climate Our Future, plus more resources for educators and several action programs for youth.	https://acespace.org/
The American Association of Geographers has free online professional development resources for teachers	http://www.aag.org/cs/teaching climatechange
Biointeractive, created by the Howard Hughes Medical Institute, has hundreds of free online education resources, including many on education and the environment, and it offers professional development for teachers	https://www.hhmi.org/biointeractive/earth-and-environment
Climate Generation offers professional development for educators nationwide and a youth network in Minnesota	https://www.climategen.org/our-core-programs/statewide-youth-network/
CLEAN (Climate Literacy and Energy Awareness Network) has a collection of resources organized in part by the Next Generation Science Standard it is aligned with	https://cleanet.org/clean/educational_resources/index.html
Global Oneness Project offers lesson plans that come with films and videos of climate impacts around the world	https://www.globalonenessproject.org/library/collections/climate-change
Google offers free online environmental sustainability lesson plans for grades 5-8	https://yourplanyourplanet.sustainability.google/
The Morningside Center for Teaching Social Responsibility has a group of 19 lessons for K-12	https://www.morningsidecenter.org/sites/default/files/2019-04/EarthDay2019TeachableMomentLessons.pdf
The National Science Teachers Association has a comprehensive curriculum.	https://www.nsta.org/climate/
Think Earth offers 9 environmental education units from preschool through middle school.	https://thinkearth.org/curriculum/

Funded by the Erasmus+ Programme of the European Union

How can I make climate change more interesting for my students and involve them in the lessons?

Most of us watch Ted Talks and we like most of them. Have you ever asked why?

It is because the speakers are great *storytellers*. They start with a story that captivates the audience's attention. Rudyard Kipling said: "If history were taught in the form of stories, it would never be forgotten".

In many schools lecturing is being criticised from students because it is boring and irrelevant. Being a storyteller will help your students create *meaningful connections* of what they hear, and it will eventually stick to their minds. Storytelling will also help them get questions to ponder upon.

Sometimes teachers need to be *creative*, *resilient*, *flexible*, *adaptable*, and able to use the available resources effectively.

People learn best when they're doing something *fun and interesting*. It's up to you to be creative in your approach, finding novel and enjoyable ways for your students to learn.

Today, our students are *digital* natives. So, we must be familiar with skills that match their interests, ambitions, curiosities, and generation.

With this remarkable change happening, teachers need to be *innovative* and creative. They should be able to create new and better things. Curriculum might not help teachers to be so innovative. But, they have to try their best.

How to implement it:

At the start of a lesson, ***use a story*** as a way of introducing a new topic.

Consider these *4* ***different types of stories*** and use any of them in your class:

- ONE OF YOUR TRUE LIFE STORIES.
- A TRUE STORY BUT NOT YOUR OWN.
- A STORY BACK IN TIME.

A FICTIONAL STORY.

When you know you are trying to teach a difficult concept, teach your class with a *story of how you managed to understand* and remember the concept when you were in their shoes.

Occasionally, straight figures and facts don't necessarily make for easy understanding, so throw in a narrative to help your class retain these hard facts.

The *classroom environment* matters: the idea of being a *designer* and a *decorator* is to be able to think about learning from the perspective of students. We need to design and decorate classrooms in a way that allows for meaningful learning experiences and serve our students most.

A teacher, who is a *digital designer*, is a highly skilled professional who is equipped with many digital skills and who can perform several tasks (typography, the design of logos, posters, brochures…etc.)

How should such a complex topic be approached in schools?

Identifying the target audience is the basic rule of communication. When addressing children, it is crucial to plan the activities according to the age group and receptiveness. For example, teaching through play or drama works well at the primary level, however, it is important to make the message more precise the older the students are.

It is crucial to encourage children to *learn by doing*.

Listening and asking questions with curiosity is the best way to *find out how much children know about climate change* and if their ideas are accurate. The level of knowledge may vary radically from child to child. Children who have discussed the topic with their parents may know a lot about it, whereas other children may have barely heard about it at all.

Teach environmental issues *across subjects.*

How to implement it:

- The best way to encourage their connection with nature is to ***spend time outside*** (for example, in the school garden or local park)
- you might want to ***observe the weather***, discuss ***differences between weather and climate***, read and listen to the stories about the topic or ***interview grandparents*** about their winter memories.
- ***Learning through exploring*** is a good way to encourage students to accumulate knowledge of any given subject.

- The internet is full of information – and also disinformation – about climate change. For this reason, teachers need to ***choose appropriate material*** to prevent misunderstandings and factual distortion.
- ***Act together with children***: although children are not responsible for solving climate change, they can still play a role in tackling it. Climate action for primary school children can be linked to classroom activities and daily life.
- ***Awareness campaigns*** initiated and developed by children usually attract media attention. Don't hesitate to contact media if you are planning a campaign!
- After taking action, it is useful ***to reflect upon the impacts*** it has had on your school or municipality. This can also be done at a general level by examining how active citizens have made a difference in your local region. It is important that children learn about causality. Change requires action and action can change the world.

I'd like to talk about climate change, but I don't teach science. How can I integrate it into my teaching curriculum?

Today environmental issues and their consequences and solutions are *hot topics* and therefore they need to be discussed in class more than just once or twice a year in biology class.

In order to motivate more young people to pursue careers in science, technology, engineering and mathematics (STEM), a number of initiatives across Europe have already aimed to weave a *closer relationship between science education and the arts and other subjects*, using inductive pedagogy and involving a wide range of actors from society and industry.

Working together with others is the best way to maximize learning.

Creating diverse learning networks, and attending professional development sessions where teachers and educators gather and work cooperatively will definitely help teachers to grow up.

How to implement it:

- ***Music*** class can provide an opportunity to review environmental songs.
- A ***cycling trip*** can be combined with learning about the environmental impacts of transportation.

- In ***mother tongue*** and literature classes students can read and write stories about the environment.
- Launch citizen initiatives as an interdisciplinary learning project with ***visual arts***.
- Tackling climate change through intercultural communication in a ***foreign language***.
- Share your idea with your ***colleagues.***
- Suggest the creation of an ***interdisciplinary path*** that brings together the participation of other teachers in your school: for example, suggest the establishment of a ***Climate change week***.
- Join national or transnational projects or campaigns.

Since this is a sensitive issue, how can I ensure a collaborative and respectful atmosphere in the classroom, especially during group work and discussions?

Conflict resolution can be a big part of the job. If you can defuse *tense situations* before they explode, you are able to handle it when students upset each other or test your authority.

Just like in life, ***relationships*** with others play an important role in our happiness and social stability. In classrooms, great relationships with students can promote a ***positive learning environment*** and raise their overall achievements.

Do we want everyone to think the same way? Absolutely, no. Our schools and classes are full of students from ***different socio-cultural backgrounds***. Every single learner has a certain way of thinking, a certain learning style, a certain strength. And as educators, we should believe in these differences, ***be inclusive***, and find ways to develop each student's strengths.

Leadership is something that has been perceived wrongly over the years. Being a leader doesn't mean to be a ''boss''. Being a leading teacher means you should be able to ***encourage*** and ***positively impact*** learners to move ahead, give them *opportunities* to lead from where they are. This way you can guarantee meaningful change taking place.

How to implement it:

- Introduce a ***rule-making session***, in which each student can make proposals. Discuss them in groups and ***agree*** together on which ones to establish. Students know what is right or wrong. If they have established the rules, they will be more inclined to respect them.
- Some examples: "In our class: 1) we ***listen*** to the others; 2) we ***don't interrupt***; 3) everyone is allowed to feel they can work and learn in a ***safe and caring environment***; 4) everyone learns about, understands, appreciates, and ***respects each other***; 5) ***everyone matters***; 6) all individuals are to be respected and treated with ***dignity and civility***; and 7) everyone shares the ***responsibility*** for making our class, a positive and better place to live, work, and learn..."
- ***Team-building*** games and activities are a great tool for helping students learn to work together, listen carefully, communicate clearly, and think creatively.
- Set up a ***classroom culture of inclusion*** and respect: reach out to a student in your class who appears withdrawn or doesn't seem to be included in the group works in the classroom.
- If conflict occurs ***stay calm and patient*** and not lose your temper.
- Acknowledge the student's ***anger and frustration***; allow him/her to vent and tell you what is upsetting him/her.
- Summarize and clarify your ***understanding*** of the student's concerns.
- Look for ways that will give the student a way to ***gracefully retreat from the confrontation***.
- As a teacher, you have to ask these ***questions***: Do my students love to come to my class? Do they like to engage, participate and collaborate? Do they feel empowered and encouraged? Do they trust me? Do they feel valued? Answering these questions will definitely help build a good relationship with students.
- Encourage students to role-play situations that require empathy, communication, and problem-solving.

How much should be explained, based on the age of the students?

The first step is to make sure you have a *good understanding* of the issues you will be addressing in class. The more comprehensive your knowledge is, the more you will be able to *adapt* each topic to the age of the students.

As the world moves ahead, you will definitely be left behind if you don't make moves and adjust your knowledge and practices to the circumstances and the requirements of the period. *Being a teacher doesn't mean you shouldn't be a learner.*

Fill in your gaps, be ready to answer any questions. It's not a matter of asking how much to say, but how to do it.

How to implement it:

- Current approaches to education suggest that teachers' roles should be first and foremost a learner alongside the children. In this respect, ***teachers are researchers*** and guides whose ultimate responsibility is to carefully examine their learners, ***listen to their concerns, and explore their interests.***
- ***Read articles***, stay updated
- ***Evaluate the sources***, and focus on reliable and certain ones
- Stay close to what ***science*** says about climate change.
- Work on your ***empathy***. When you put yourself in someone else's shoes, you can better understand how to convey the information.
- Avoid spreading false information.
- Climate change is partly linked to other environmental problems, but that doesn't mean that all the environmental issues are connected. At the primary level, it is not necessary to introduce the causal relationships between ***social and environmental problems***.
- One of the most common misunderstandings is that the ***greenhouse effect*** caused climate change. Climate change and the greenhouse effect are related in other ways.
- We have already shortly discussed how climate change education should be tailored according to the age of the target audience. Another useful guideline is to handle the situation on a case-by-case basis. If a child asks directly about climate change, ***tell the truth***. Climate change is a serious issue.

Dealing with misinformation and fake news

Misinformation and "fake news" have the potential to polarize public opinion, to promote violent extremism and hate speech and, ultimately, to undermine democracies and reduce trust in the democratic processes. This is maybe a bit premature for the children in your class, but it is vital for

schools to provide students with a solid education on media and information literacy as part of the curriculum.

Teachers must be well trained in the subject to empower students with the necessary competences to critically understand and assess information reported by all forms of media.

Exposure to fake news casting doubt on the existence of climate change influences individuals' expressed belief in climate change, their estimate of the scientific consensus regarding it, and their overall trust in scientists.

For this reason, teachers must be able to deal with misinformation and fake news.

Schools must be places where students feel safe to engage in debates with people who have different opinions. Therefore, if someone (children repeating what their parents say, or they read online …) is basing their assumptions on distorted/fake information they should be supported to express their opinion, and by discussing, sharing and analyzing real and reliable data, they have to come up with a more informed opinion.

FAKE NEWS: HOW TO SPOT IT

The topic of fake news is as old as the news industry itself—misinformation, hoaxes, propaganda, and satire have long been in existence. This guide will help you determine the kinds of fake news that exist and provide tools for how to evaluate news for its reliability and truth.

What is Fake News?

Fake News is: information that cannot be verified, without sources, and possibly untrue.

TYPES OF FAKE NEWS

While fake news can take many forms, there are several broad types.

Deliberate Misinformation - There is fake news written for profit and then shared on social media among targeted groups of people who want to believe that it is true. The intention is for the fake news to spread without readers taking the time to properly verify it. This type of fake news is untrue news.

False Headlines - A news headline may read one way or state something as fact, but then the body of the article says something different. The Internet term for this type of misleading fake news is "clickbait"—headlines that catch a reader's attention to make them click on the fake news. This type of fake news is misleading at best and untrue at worst.

Social Media Sharing - Social media's ability to show a large number of news items in a short time means that users might not take the time to research and verify each one. These sites often rely on shares, likes, or followers who then turn news items into a popularity contest—and just because something is popular and widely-shared does not mean it's true.

Satire - Satire news or comedy news often begins with an aspect of truth then purposefully twists it to comment on society. Satire news has the potential to be spread as though it is real news by those who do not understand its humorous nature.

EVALUATE AND VERIFY

We provide some tips and information on how to verify the news that can be found online. Those suggestions for a class activity to verify something that has been circulating on the news recently. Obviously, this practice is not limited to verify resources and news on climate change but to any topic that is (maybe) controversial. This could also lead to an increase in the critical thinking abilities and other connected skills, as it will guide them in making sure they possess enough information to formulate an opinion. And most importantly, that the opinion they are creating is based on reliable sources and proofed facts.

Media Literacy - The process and ability to be able to evaluate and separate fake news from real news is a part of media literacy and, on a broader level, information literacy. There are strategies that you can use to become a savvy judge of news especially online or when using social media. Below are three questions that you should always ask yourself when evaluating a news story.

Question 1: Who is the creator?

The first question in figuring out if something is fake news is by looking at the individual who created it, or understanding the organization behind it. When assessing news, especially that which exists on the Internet, it is important to review the following:

- Where did you find the information/news?
- What is the name of the organization creating or hosting the content?
- Does the organization have an "about us" link?
- Who is the organization, is it a university, a researcher institute…

- Look at the URL. Is the real one? Check for the ending of the website's URL: .gov, .edu, and .org are more credible than websites many others.
- Is the author listed on the site, or is there an "about me" section?
- Is there a by-line or introduction, and are you aware of the person's expertise?
- Search the Internet for more information about the author. Search LinkedIn, a social media site for professionals.
- Search an online library catalogue to see what books the author has written.

Question 2: What is the message?

The second question in determining if something is fake news is by looking at the message itself and understanding what is being communicated. Review the following:

- What is the content of the message?
- Can I find this same news in multiple places?
- Do multiple places use different experts and sources in their reports?

- Is the website this news appears on updated regularly?
- What is the date of the story?
- Check the sources from the story and their expertise. Are they anonymous?
- Are sources in quotes? Quotes lend greater authenticity and credibility.
- Can you figure out if there is bias in the message? Is there a slant to the news?
- Is the news fact or is it more opinion?
- What viewpoint is being expressed and what is being left out?
- What is the format of the message? Look at visual elements and text elements.

Question 3: Why was this created?

The third question in determining if something is fake news is by looking at why the message was created. Review the following:

- Can you tell what motivated the creation of this message?
- Was this message created for profit?
- Is this news actually an advertisement?
- Are the sources being paid?
- Is the author being paid?
- If the content lists itself as "sponsored content" that means an individual or organization is paying to display the content.

It is always a good idea to verify information before you share it with others—in person or on social media. Aside from the three questions above, an additional method that works is the CRAAP test—look at the content for its **currency**—the timeliness of the information, **relevance**—the importance of the information to your needs, **authority**—the source of the information, **accuracy**—the reliability and truthfulness of the information, and **purpose**—the reason the information exists.

Bibliography

Teachers' Learning about Climate Change Education, John Oversby*

University of Reading, Institute of Education, Reading, RG1 5EX, UK

https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity?languag e=en#t-49877

https://www.youtube.com/watch?v=UCFg9bcW7Bk

https://www.teachthought.com/the-future-of-learning/10-innovative-learning- strategies-for-modern-pedagogy/

https://www.goconqr.com/en/examtime/blog/teaching-techniques/

https://www.powtoon.com/blog/effective-teaching/

https://www.prodigygame.com/blog/wp-content/uploads/classroom- management-strategies-infographic.png

https://www.prodigygame.com/blog/teaching-strategies/#resources https://www.realinfluencers.es/en/2019/05/09/8-21st-century-methodologies/

https://www.edsys.in/16-innovative-ideas-make-teaching-methods-effective/

https://teach.com/what/teachers-know/teaching-methods/

https://www.intechopen.com/books/new-pedagogical-challenges-in-the-21st-century-contributions-of-research-in-education/pedagogy-of-the-twenty-first- century-innovative-teaching-methods

https://www.npr.org/2019/04/25/716359470/eight-ways-to-teach-climate- change-in-almost-any-classroom

https://blog.planbook.com/teach-climate-change/ https://cleanet.org/clean/literacy/climate/index.html

https://www.coe.int/en/web/campaign-free-to-speak-safe-to-learn/dealing-with-propaganda-misinformation-and-fake-news

https://www.fastcompany.com/

https://education.gov.gy/web/index.php/teachers/tips-for-teaching/item/1504-effective-communication-tips-for-the-classroom

https://teachers-climate-guide.fi/climate-education-at-the-primary-level/

https://teachingcommons.yorku.ca/resources/teaching-strategies/managing-conflict-in-the-classroom/

https://www.teachingprofessor.com/for-those-who-teach/creating-respectful-classroom-environment/

https://www.positivediscipline.com/articles/listening-skills-teachers

https://edutopians.com/2019/05/25/a-list-of-the-most-critical-21st-century-skills-teachers-should-have/

https://www.brightnetwork.co.uk/career-path-guides/education-teaching/key-skills/

https://www.lulu.com/shop/drpc-naga-subramani/effective-teaching-and- learning/paperback/product-22827880.html

http://www.slideshare.net/bobr/ [Accessed: 2012-06-30]

https://www.prodigygame.com/blog/teaching-strategies/#resources

https://www.prodigygame.com/blog/classroom-management-strategies/

https://youtu.be/iQWvc6qhTds (YouTube link where it is better explained the Flipped Classroom Methodology)

https://www.goconqr.com/en/learn/flipped-classroom/ - GoConqr's free online learning tools can be integrated into the Flipped Classroom teaching model. Using GoConqr, you can easily share resources with a group, in this case a class, allowing students to study these resources from home and prepare for the next class.

https://youtu.be/rWEwv_qobpU

https://www.bbc.com/future/article/20191010-how-to-beat-anxiety-about-climate-change-and-eco-awareness

https://www.afr.com/policy/health-and-education/the-evidence-is-in-for-the-future-of-education-20190412-p51dh9Check more: https://youtu.be/VnXdj0yqpzI

challengebasedlearning.org

https://climatekids.nasa.gov/menu/teach/

https://ncse.ngo/teaching-climate-science-its-elementary

https://www.commonsense.org/education/articles/5-free-tools-for-teaching-about-climate-change

https://oceanservice.noaa.gov/education/planet-stewards/#3

https://www.plt.org/educator-tips/videos-climate-change-middle-school

https://blog.planbook.com/teaching-biology/

http://www.nea.org/climatechange

https://climatechangeconnection.org/

https://hechingerreport.org/teaching-global-warming-in-a-charged-political-climate/

https://blog.planbook.com/teaching-performing-arts/

https://populationeducation.org/5-kid-friendly-ideas-for-teaching-climate-change-in-elementary-grades/

https://www.pbs.org/newshour/science/how-to-talk-to-your-kids-about-climate-change

http://neatoday.org/2017/03/14/teaching-about-climate-change/

https://kidsagainstclimatechange.co/

https://gpm.nasa.gov/education/weather-climate

https://www.earthsciweek.org/classroom-activities/ngss

https://www.beforetheflood.com/act/

https://www.commonsensemedia.org/lists/movies-that-teach-kids-about-climate-change

https://www.inconvenientsequeleducation.org/educators/

https://www.adventurescientists.org/

https://www.thepermaculturestudent.com/ - Check the site for resources on building school gardens with rainwater capture and compost systems to regenerate the soil. There are local and regional resources such as the Collective School Garden Network (http://www.csgn.org/why- school-gardens) in California and Growing Minds (https://growing-minds.org/school-gardens/) in North Carolina, which offer basic plans for a school garden as well as lesson plans that connect gardening to Common Core standards.

http://www.vfo.be/docs/VFOstudiedag2008-131-Ferla2.pdf (Learning Conceptions and their Impact on Higher Education Students' Study Strategies and Academic Achievement

https://youtu.be/g8NZS-QZd98

https://www.realinfluencers.es/en/2015/12/02/claves-del-aprendizaje-cooperativo-en-el- arenales-carabanchel/

https://youtu.be/LMCZvGesRz8 (Project Based Learning: Explained)

https://www.apa.org/monitor/2016/07-08/climate-change#:~:text=Exposure%20to%20climate%2D%20and%20weather,events%20develop%20chronic%20psychological%20dysfunction