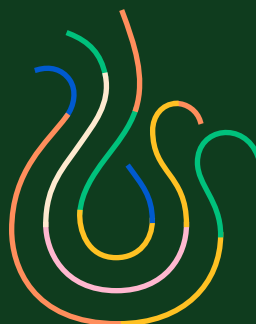EDUSCAPE

Methodology of landscape & climate change adaptation in education

Theoretical background
& methodological approach

EDUSCAPE

Methodology of landscape & climate change adaptation in education

Authors:
Dr. habil D.I. Peter Kurz
Prof. emeritus Richard Stiles

TECHNISCHE UNIVERSITÄT WIEN

EDUSCAPE

Content

**Methodology of landscape
& climate change adaptation
in education**

The Virtual and the Real – Learning Laboratory Landscape?

Growing up today, children are confronted with a world which is facing challenges from two seemingly disparate quarters. Firstly, society as a whole is subjected to a wide range of existential threats, of which climate change is the most pressing but by far not the only one. All of these challenges demand to be taken seriously, and all call for our direct engagement with the physical world if they are to be effectively addressed. Yet, pulling in the opposite direction is an overwhelming force exerted by a very different world. In this world in the virtual increasingly trumps the real, and even for young children reality is more and more viewed through the screen of some digital device, bringing with it a strong temptation to withdraw from an ever more threatening reality into the beckoning arms of the digital world. Contemporary school education must seek to address both these issues.

Today humanity is at a crossroads

Fig. 1
Caspar David Friedrich (left) exemplifies the expansive overview required to address the existential challenges facing society while René Magritte's introverted focus provides a fitting image for the narrow focus reflected by the on-line world.

These two worlds place very contrasting, if not conflicting demands on ourselves and even more so our children, and both are being driven by different forces. Understanding and thriving in the world of digitalisation calls for a closely focussed, reductionist mind-set, which is analytical, and for example, the ability to break down reality into a series of algorithms. And digitalisation is progressing apace, with the enthusiastic support of government policy, not to mention the all-powerful tech industry. Digital literacy is increasingly expected of teachers, and more and more children are confronted with tablet or laptop classes during the semester while being urged to spend vacations at coding camps. And all this is despite the growing awareness of the psychological harm which the online world with its dominance by social media are causing to all, but to young people in particular. Recent publications (such as Zuboff, 2019 or Foroohar, 2019) have drawn attention to the ways in which the very business models of social media companies can cause harm:

> "*Unsurprisingly, children, who spend more time with social media, games and apps than adults do are more vulnerable… 'Parents don't understand… that their children's and teens obsession with technology is the predictable consequence of a virtually unrecognized merger between the tech industry and psychology. This alliance pairs the consumer*
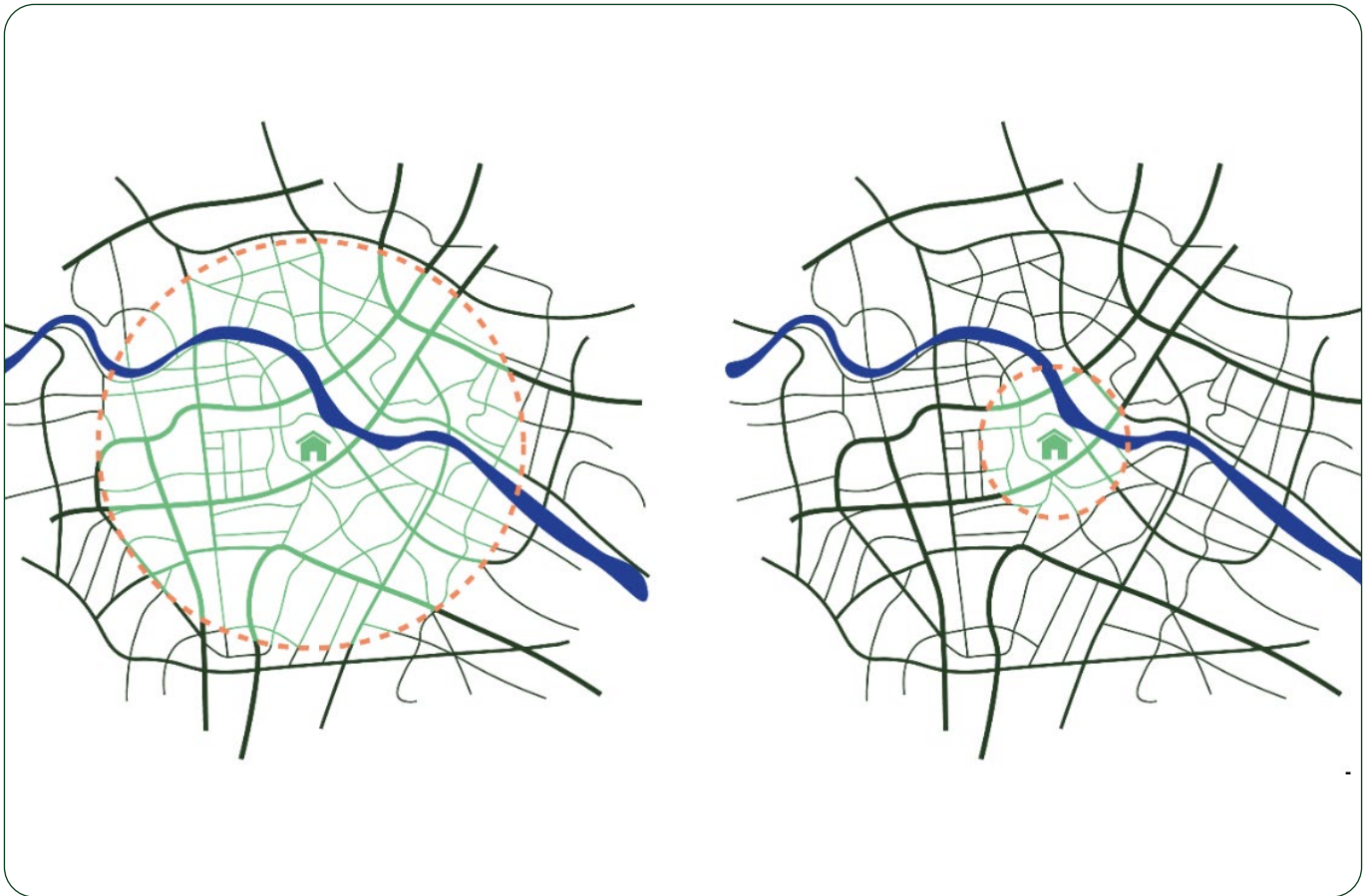
Fig. 2

The 'home range' of children has diminished considerably over recent generations

tech industry's immense wealth with the most sophisticated psychological research, making it possible to develop social media, video games and phones with drug-like powers to seduce young users'. Psychologists and social anthropologists are being hired in droves by the largest companies (and many smaller ones too) to help the technologists transfer the latest persuasive research and techniques into ever more tricked-out products designed to capture ever-more children's attention." (Foroohar, 2019[1] p. 116 ff.)

Engagement with the 'real world', by contrast appears to lack powerful and self-interested backers equivalent to those driving forward digitalisation. On the contrary, direct experience of being in the 'real world' for children appears to be being increasingly eroded by a wide range of developments. 'Playing outside' in the park or the street used to be the default situation, but increasingly over-protective parents now see the world as a dangerous place for children. Whether it is road traffic or 'stranger danger' there appear to be many reasons why children are thought to be safer playing at home – often in front of a computer screen. This has also led to the phenomenon of the 'school run' whereby children who in earlier generations would walk or cycle to school are now driven by car and dropped off at the school gates, leading to amongst other things

1   The 'home range' of children has diminished considerably over recent generations

a significant rise in rush hour traffic and a self-fulfilling prophecy of why it is safer to take children to school by car.

Studies have also shown than the 'home range' of children – the area of the town around their homes which they regularly explore on foot and are thus directly familiar with – has become dramatically smaller over recent generations:

> " *"In a typical case, the grandmother, who grew up in the 1960s, regularly walked a couple of miles by herself to meet friends at the local youth club; her daughter, a child of the 1980s, was allowed to visit a shop a third of a mile from her home, while the furthest her ten year old grandson can travel on his own is a friend's house a hundred metres down the road. In this family the home range has contracted thirty-fold in just three generations[2]."*

This trend has only been accelerated by the impacts of the Corona pandemic[3], when on-line teaching became the norm and children were stuck at home for long periods, unable to venture out into the real world resulting in both social isolation and lack of exercise. Both the mental and physical effects of this have still to be come to terms with, and will continue to linger even after any impacts of 'Long Covid' have been forgotten, yet the 'digital revolution' continues to be driven harder and faster by the policies of governments across the world. And this says nothing of the leisure time habits and 'screen-time' consumption of children away from the learning environment, with their implications for the growing obesity crisis and other health and fitness deficits.
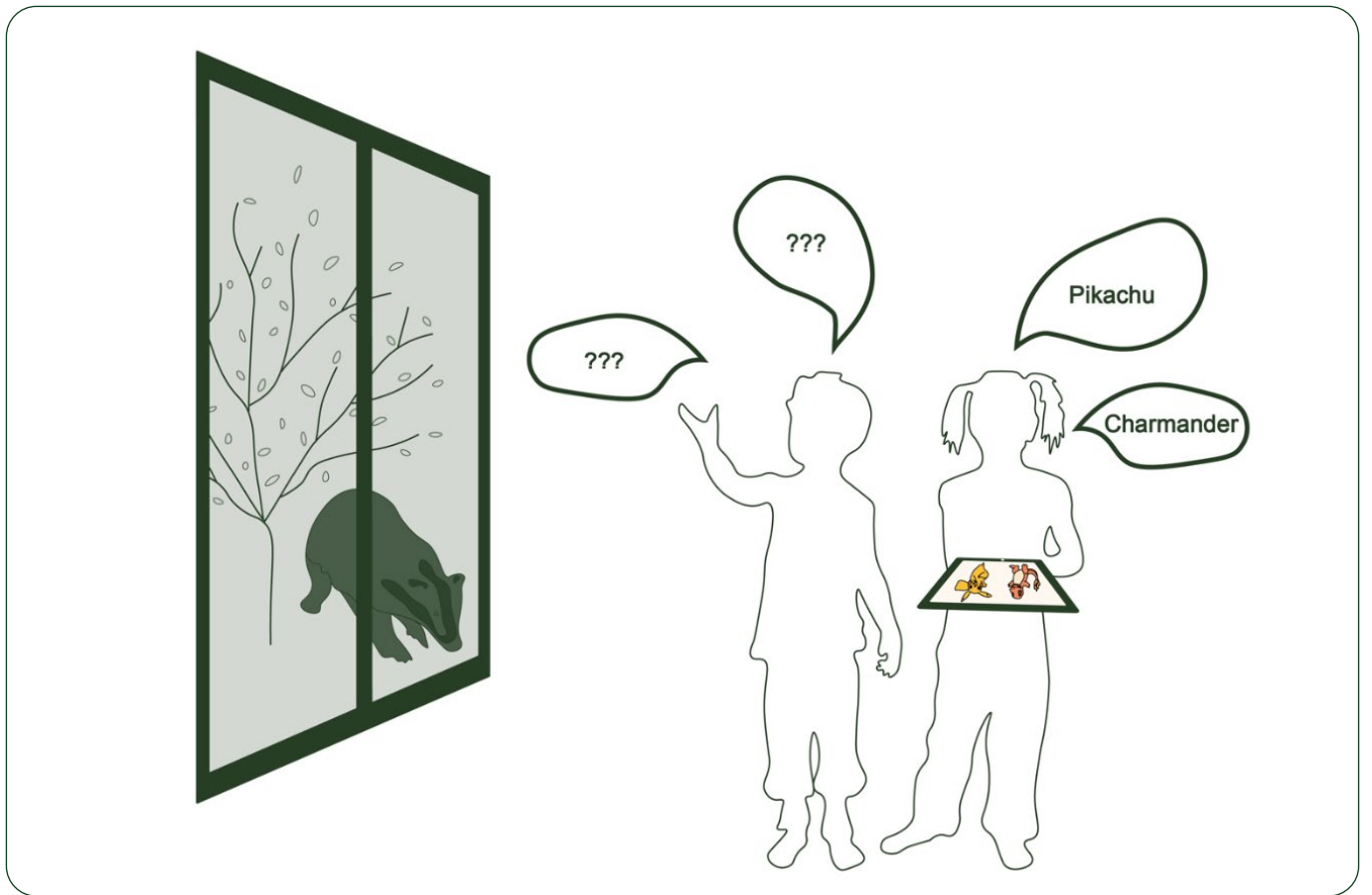
Fig. 3

Children are increasingly more familiar with the virtual world than the 'real' one.

It is perhaps not surprising, then, that a study cited by the writer and academic Robert Macfarlane in the Guardian newspaper[4] – well before the Corona pandemic – reported that today's school children were more likely to be able to identify characters from the computer game Pokémon (Fig, 3) than native wild plants and animals:

> "The results were striking. Children aged eight and over were 'substantially better' at identifying Pokémon 'species' than "organisms such as oak trees or badgers": around 80% accuracy for Pokémon, but less than 50% for real species. For weasel read Weedle, for badger read Bulbasaur... They (the study's authors) pointed to evidence linking "loss of knowledge about the natural world to growing isolation from it". We need, the paper concluded, "to re-establish children's links with nature if we are to win over the hearts and minds of the next generation"

Winning over the hearts and minds of the next generation is also the key to addressing the most pressing of all threats to society: climate change which, if not tackled urgently, will mean that the natural world as it has been known for millennia will no longer be recognisable or even available for coming generations to learn about, let alone to enjoy. Another recent

2   Wooley and Griffin, 2015 cited in Michael Bond 'Wayfinding' 2020, p. 25

3   The hidden impact of COVID-19 on children's education | Health and Education Resource Centre (unesco.org)

4   https://www.theguardian.com/books/2017/sep/30/robert-macfarlane-lost-words-children-nature

piece of research also draws attention to the 'growing disconnect' between children and nature, as borne witness to by an analysis of school children's drawings (Howlett and Turner, 2023). Understanding and thriving, even or perhaps especially, in the world of digitalisation will also call for us, and in particular our children, to continue to have a holistic embodied understanding of not just the 'virtual', but of the 'real' human environment, the physical world in which we live. Not just an abstract understanding, but the direct encounter with the immediacy of the 'outside world' will continue to be as vital as it has ever been for grounding human life and understanding in the dawning Anthropocene Age, although with the irresistible advance of the digital world, it will in future be increasingly difficult to maintain a healthy balance between the real and the virtual.

School was, perhaps, once a sort of (enforced) 'safe haven' from screen time for children, but the rise of digitalisation in education is putting an end to this, making a clear case for some kind of preventative strategy to compensate for its impacts, although this seems, at least superficially to contrast with recent initiatives to have mobile phones banned from schools[5].

The restorative powers of nature have long been recognised as a means of intervening to treat cases of stress and burnout, from the Japanese 'shinrin-yoku' or forest bathing[6], to the 'nature prescription' programmes being experimented with by Western medicine (Kondo et al, 2020; Leavell et al 2019), but prevention is universally recognised as being better than cure. Because the advance of the digital world is receiving all the support and encouragement it needs, the key to achieving the necessary balance will be to move the environment closer to the centre of the teaching and learning process in order to complement and compensate for the push towards on-line learning, and indeed on-line living. But this should not just be the environment understood as a further series of isolated and objectivised series of classroom-based subject areas, which are increasingly likely to be mediated by digital media – important as these will be for addressing the multiple societal challenges we are facing – but rather the environment as a living physical place in which humans play a central role. In Europe, where some 70 % of the population lives in urban areas, any form of 'nature bathing' as part of the school curriculum is hardly feasible, but using the local landscape as the medium for education is another matter. The landscape encompasses nature but takes in much more and is universally available to all schools. Teaching and learning about and through landscape is the focus of the EduScape project: landscape – to paraphrase the European Landscape Convention – is the environment as perceived by people. Indeed Article 6, Section B 'Training and Education' of the Landscape Convention calls explicitly for

5   UNESCO calls for a ban on phones in schools. Here's why | World Economic Forum (weforum.org)

Government launches crackdown on mobile phones in schools – GOV.UK (www.gov.uk)

French school students to be banned from using mobile phones | France | The Guardian

6   What is 'forest bathing' – and how does it help? | National Geographic

> *"school and university courses which, in the relevant subject areas, address the values attaching to landscapes and the issues raised by their protection, management and planning."*

Central to EduScape is the landscape that children can experience outside their own front doors and in the neighbourhoods in which their schools are situated: the landscapes in which they live their everyday lives.

While it is accepted that the march of digitalisation cannot and should not be stopped, EduScape aspires to create a 'real world' framework within which the application of digital technologies can be grounded in the landscapes in which we live. Alongside the current and widely held conviction of the importance of digital literacy, it is therefore time to complement this with a second, fundamental competence: that of landscape literacy. The project is thus inspired by the conviction that the future will belong neither to the 'digital natives' nor the 'eco-warriors', but instead aims to foster for a new generation which embodies and integrates these two positions. It seeks a new synthesis capable of meeting the challenges the future will bring. This should empower children to recognise and to value the 'real' as opposed to the 'fake', and be one in which experience of the landscape of the real living world is the guiding force, which can then be further illuminated with the help of the virtual realm, but in its proper role as servant and not master.

This introduction has aimed to explain why, at a time in which the word digitalisation' is on everyone's lips, landscape needs to become a central medium for teaching and learning in our schools. The next section provides a foundation for this by elaborating on the contemporary understanding of landscape, while section three explains how the concept of landscape is congruent with today's pedagogical theories. Section four illustrates how landscape can provide an overall theme for creating teaching units and finally, Section five illustrates how and where the landscape can be integrated into teaching the school curriculum.

CHAPTER

What is landscape and why is it important? (Re-)Introducing Landscape

2.1 The development of the idea of landscape: origins and recent developments

Landscape is not what it used to be. This may sound like an odd statement to make as of course the landscape is changing, it always has and, no doubt, always will. But this is by no means the whole story: it is not just the landscape itself which is changing, so is our understanding, our perception of it and, what is more, we are realising that our perception is itself an integral part of landscape. A vital part of this change involves a wide-reaching reassessment of the importance of landscape as an idea, indeed as a way of looking at the world, which is why landscape is becoming an increasingly important concept in society today, and why it is not just a subject which now needs to be addressed in school education but also a medium through which primary and secondary education can take place. This methodological introduction aims to briefly outline the nature of this new understanding of landscape as a broad, all-embracing concept, and then to demonstrate how it can be applied as a new approach to teaching and learning, as well as to show how the idea of landscape literacy can.be developed to complement that of digital literacy.

A key milestone which was critical in cementing this process of re-framing landscape was the opening for signature in the year 2000 of the European Landscape Convention, the first international treaty to be concerned solely with the landscape. However, while this re-conceptualisation of landscape is the outcome of relatively recent developments, it marks the culmination of a long process of reassessment/evolution? However even the word 'landscape' itself is, from an historic perspective, comparatively new. The term was first recorded in English as an introduction from the Dutch where it was first used in the late 16th century to describe what was then a novel style – or rather a subject matter – of painting

Until then, the accepted subject matter for European artists was largely either biblical or related to events from classical antiquity, and any depiction of landscape was largely limited to the background settings for these subjects. Landscape painting, as well as the word itself, seems to have arisen in Flanders and, according to the Shorter Oxford English Dictionary the word entered the English language between 1570 and 1599 (O.E.D., 1993), although Cosgrove (1984) traces the origins of the landscape idea, if not the word, back to the Renaissance in Italy, when humanism give humankind a new sense of self-awareness and agency through which it could rise above the influence of its immediate

surroundings. He also links the rise of landscape as a way of seeing the world to the new techniques of perspective representation through which a degree of control could be exercised over the depiction of the environment by a new class of patrons.

This, it is suggested, was the result of the fact that at this point in history, people for the first time began to become aware of their surroundings as something distinct from themselves. What was previously unremarkable – the everyday environment of which people were an integral part and in which they lived and worked under the feudal system, each being tied to their native corner of the earth – became objectivised as an entity in its own right. This made it possible to step back from it, to look at it critically, to reflect upon it and thus to make it the subject matter of paintings. But, of course, this also implies that from then on it could no longer be taken for granted that we, as humans, were an integral part of our environment, but rather that the landscape became something apart from this and that we were not part of the landscape, but rather somehow 'on the outside, looking in'.

Fast forward to the early eighteenth century, and this new viewpoint made it possible to see landscapes not just as potential subject matter for painting and the other Arts, but also as something in which people could intervene in and manipulate in a creative manner. It was William Kent, one of the originators of the English landscape garden, who according to Horace Walpole's epitaph "*…leapt the fence and saw that all nature was a garden*". However, while the landscape garden was developed in England during the 18th century and spread to the rest of Europe in the 19th, the idea of landscape that it embodied became firmly associated with visual scenery and with the artfully staged view.

Elsewhere, also in the late 18th century, a new approach to understanding the physical landscape as an object of scientific study was being developed by the German geographer and naturalist Alexander von Humboldt during his travels in South America. He defined landscape as 'the total character of a region of the earth', the product of the interaction between its geophysical and biological characteristics. This holistic, natural sciences-based, understanding of landscape developed subsequently particularly in Germany and the former Czechoslovakia, leading eventually to the foundation of the discipline of landscape ecology, which provided ecology with a spatial dimension and provided a scientific basis for landscape planning (Naveh & Lieberman, 1983; Forman & Godron, 1986,).

But the traditional discipline that has long regarded landscape as one of its main focusses of interest is Geography. While physical

geographer's interest in landscape tended to concentrate on landscape ecology related approaches as pioneered by von Humboldt, it has been cultural geographers who have been most active in the field of landscape over recent decades (Wylie, 2007). Their approach to landscape has, however, been far from unified but rather rich and varied, and to some extent contradictory. Nevertheless, certain themes recur, most of them concerning the inherent dualities of the idea of landscape, which can be at once a lived-in physical, spatial reality involving the duality of natural and cultural influences, as well as something perceived or even imagined from the 'outside', and having a strong symbolic meaning. In his overview of the recent developments in cultural landscape studies, Wylie (2007 p. 13) refers to the 'revolution in landscape studies which occurred from the mid- 1980s to the mid-1990s'. This revolution can be thought of as one of the developments, at least, which prefigured the establishment of the European Landscape Convention.

More recently, branches of other disciplines have also adopted a landscape perspective and added the word to their name, including in particular 'landscape archaeology' (David & Thomas, Eds, 2006; Johnson, 2007; Haupt, 2012) and more recently still 'landscape urbanism' (Waldheim, 2006), albeit with different emphasis in each case. With regard to archaeology the 'landscape' prefix again stresses the spatial dimension and the need to consider the interaction of prehistoric societies with the environments in which they lived, while in the case of urbanism, which already is a spatial discipline, the 'landscape' prefix appears to focus primarily on the role of ecological and green space elements of the urban environment and their dynamics: *"Landscape urbanism describes a disciplinary realignment currently underway in which landscape replaces architecture as the basic building block of contemporary urbanism"* (Waldheim, Ed. 2006). The only exception to the widespread and seemingly growing use of the prefix 'landscape' by various professions and disciplines is landscape architecture. This important distinction is noted by Shelley Egoz (Egoz, 2019 p.84):

" *"Nevertheless, it is only the discipline of landscape architecture…in which landscape is not a choice of scholarly approach to be adopted but the essence of the discipline and profession."*

Landscape architecture is also the discipline driving the EduScape project.

COUNCIL OF EUROPE LANDSCAPE CONVENTION
CONVENTION DU CONSEIL DE L'EUROPE SUR LE PAYSAGE

2.2 Leaping the fence 2.0 — The European Landscape Convention and its consequences:

Fig. 4

The Council of Europe Landscape Convention has shaped the landscape discourse since 2000 when it was first opened for signature – since then 40 countries have ratified it

As the first international treaty which has sought to bring the subject of landscape into the political, economic and wider public mainstream the European Landscape Convention had a relatively long period of gestation, but it undoubtedly aspired to place the subject of landscape in the mainstream: *"Noting that the landscape has an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation"*[7].

It was in 1994 at the 1st Plenary Session of the Council of Europe's Congress of Local and Regional Authorities (CLRAE), that the then Standing Conference of Local and Regional Authorities of Europe, was called upon to draw up, on the basis of the *Mediterranean Landscape Charter – adopted in Seville by the regions of Andalusia (Spain), Languedoc-Roussillon (France) and Tuscany (Italy) – a framework convention on the management and protection of the natural and cultural*

7   From the Preamble to the ELC

landscape of Europe as a whole"[8]. Yet, only a decade earlier in his seminal study 'Social Formation and Symbolic Landscape' (Cosgrove, 1984), the cultural geographer Denis Cosgrove had suggested that landscape was no longer a mainstream concern: *"Landscape today is pre-eminently the domain either of scientific study and land planning, or of personal and private pleasure. It no longer carries the burden of social and moral significance attached to it during the time of its most active cultural evolution."*

Despite this, when the final agreed text of the Convention was finally opened for signature in 2000, – with its wish: *"to provide a new instrument devoted exclusively to the protection, management and planning of all landscapes in Europe"*, the speed of its adoption and ratification by the membership of the Council of Europe[9] was a remarkable demonstration of its topicality, given its previous relegation by Cosgrove to being no longer anything more than a niche concern.

However, despite the apparent lack of foresight on Cosgrove's part regarding the current public interest nature of landscape, many of the aspects contained in the Convention can be seen to carry the imprint of his ideas, in particular the complex, multi-layered concepts behind the understanding of landscape.

A particularly important contribution of 'Social Formation and Symbolic Landscape' (Cosgrove, 1984) was its documentation of the multi-faceted nature of the landscape concept, Cosgrove even refers to its 'dual ambiguity' (p.15). He stresses both its subjective and objective aspects as both a way of seeing and a phenomenon which can be subjected to analysis, while also noting that the objective characteristics of landscape as a focus of scientific study also divide into its natural and human-influenced aspects. As a result, these reflections can be seen as providing much of the preliminary groundwork behind the definition of landscape which was finally agreed in the text of the Convention, and his statement that *"…landscape denotes the external world mediated through subjective human experience…"* closely prefigures the landscape definition which forms the centrepiece of the Convention:

> " *"Landscape" means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."*

Beyond its mere existence as the first international treaty to deal exclusively with landscape, and pointing to its broad 'public interest role', the European Landscape Convention has been innovative in other ways too. In particular, by emphasising that landscape was not just some special

8   See Explanatory Report on the origins and aims of the Convention.

9   Currently the Convention has been signed by 41 and ratified by 40 of the 46 member countries of the Council of Europe.

phenomenon to be found in distant places such as national parks or areas of special scenic beauty, as might previously have been the common understanding, but that it was an *"important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as in areas of high quality, in areas recognised as being of outstanding beauty as well as everyday areas"*. Furthermore, as the Convention was deemed to be applicable across *"the entire territory of the Parties"* and covered *"natural, rural, urban and peri-urban areas"* and includes *"land, inland water and marine areas."* By emphasising that the Convention *"concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes"* landscape, as a way of seeing the world, was brought to everyone's front door, thereby making it the perfect and completely accessible shared medium for teaching and learning about the world.

As well as being accessible to all, the fact that the European Landscape Convention[10] is a treaty of the Council of Europe – a much broader organisation than the European Union (46 rather than just 26 member states), whose main areas of concern are: *'democracy, human rights and the rule of law'*, means that the subject of landscape is also recognised as being of wide relevance, in that it is essentially bound up with fundamental human rights and freedoms, and is not just a matter of, for example, environmental protection or cultural heritage.

What the new, wider, understanding of landscape also does, is to re-integrate people into the landscape. Whereas the arrival of the concept of landscape in the 16th century put humans on the outside as observers, landscape now can be seen as an integral part of the way in which we understand and relate to the world around us. One might even say that, whereas William Kent, *"Leapt the fence and saw that all nature was a garden"*, thanks to the European Landscape Convention, we have now leapt the fence for a second time and discovered that all Europe is landscape – the European Landscape Convention, one might say, has thereby given us 'leaping the fence 2.0'!

Consequently, the Landscape Convention can be seen as having done two major things for our current understanding of landscape. Significantly, it can be seen as representing the culmination of an historic process, during which various disparate ideas of landscape have become integrated, and the topic has been brought into the mainstream of political awareness and public consciousness. Equally important, though, have been the new insights that the Convention has introduced. The first of these is that landscape is ubiquitous – there is nowhere that is not landscape: everyday and degraded landscapes are considered just as valid as areas which might previously have been thought of as somewhere special. Just as significant

10 Recently the European Landscape Convention has been re-named as the Council of Europe Landscape Convention

is the fact that landscape is not just to be found everywhere, but that it is a matter of broad societal concern, being made the subject of a convention drawn up by the international governmental organisation responsible for human rights, democracy and the rule of law. Landscape is therefore not just everywhere, but for everyone.

These factors, as well as its innate qualities from being the result of both natural factors and human influences, makes landscape a rich and easily accessible resource for both project- and place-based teaching and learning.

2.3 Landscapes of the heart and the mind

'Landscape and the human heart' was the title of a talk given by the writer Robert Macfarlane[11] in which he expressed the conviction that we are all shaped by the landscapes we encounter and refers to *"the reciprocality between people and their landscape"*. He talks about *"the ways in which our minds, and our moods, our imaginations and our identities are influenced by the textures and the weathers and the forms and the slopes and the curves and the creatures, remembered and actual of the places we inhabit… the ways in which the feel of the world influences our feeling for the world."*

However, the relation between 'landscape and the human heart' which has been recognised in literature and the arts has also been paralleled by a concern with on the part of the science of neurology, which has thrown new light on to the question of landscape and the human brain.

The, initially, unlikely sounding relationship between the brain and the landscape is brought into focus by an aspect of the European Landscape Convention's widely accepted definition of landscape which has been largely overlooked, namely that the landscape is *"an area, as perceived by people"*. The use of the word perceived begs the question of how exactly it is that humans perceive landscape and what implications does this have? Of course, we perceive the world through information provided by our five senses, although predominantly sight, however, the incoming sensory information has to be interpreted by the brain, which is in turn modified by existing memories and associations – or *'mediated through subjective human experience'* – in the words of Denis Cosgrove.

Neurological research makes it clear that the landscape is not just 'something out there' which we perceive passively, but that the relationship between the landscape and the brain is a reciprocal one. It is not just that the brain shapes our perception and understanding of landscape, but that the landscape itself has shaped our brains over the course of evolution. This should not be surprising, as humans – and all other animals – have evolved to survive in particular landscapes and the brain has evolved as a 'tool' to support this process and in parallel with it. We humans are thus inextricably bound up with our surroundings.

Neurologist and Nobel Prize winner, Gerald Edelman (Edelman, 2006 p. 24) draws attention to the fact that as human beings our minds, as

mediated by our brains, are indirectly, at least, conditioned by and locked in to the landscapes in which we live: *"The brain is embodied and the body is embedded...in a particular environment."* In 'The Book of Minds', science writer Philip Ball makes a similar point even more forcefully: *"...a Space of Possible Minds is not a map of types of brains, nor even of types of organism. Minds have a function that is defined, shaped and arguably embodied by their environments."* (Ball, 2022, p.111).

Another Nobel Prize winning neurologist, Erich Kandel, makes reference to the way in which the viewer of a painting also contributes to the experience of a work of art. This is what the art historian Ernst Gombrich described as the 'beholder's share' (Kandel, 2016 p. 18 ff.). This also stresses the reciprocal process involved in the perception of art, but is of course equally be relevant for how we as humans perceive landscapes. In an influential essay published in the book 'The Interpretation of Ordinary Landscapes', the American geographer Donald Meinig has also stressed that: *"...any landscape is composed not only of what lies before our eyes, but what lies within our heads"* (Meinig [Ed.] 1979 p. 34).

These insights make it clear that, not just from a cultural but also from a biological perspective, human beings are not just an integral part of the landscape, but that the landscape is an integral and essential part of each of us.

A further manifestation of this takes the form of so-called 'habitat selection theory' put forward by the American ecologist Gordan H. Orians (Orians, 1980), according to whom, humans are attracted to savannah-like landscapes of open grasslands and groups of trees as this was the hospitable habitat within which *Homo sapiens* evolved over the course of several million years. Recognising and being attracted to such landscapes had an important survival value, which has led to our affinity for this type of landscape becoming 'hard-wired' into our genetic make-up. This is even said to extend to our aesthetic preferences for different species of acacia trees, with the ones felt to be most attractive being those which are also indicators of water availability, and thus by implication of environments favourable to human survival.

But the relationship between landscape and brain function go further too and resonate with the dual nature of the idea of landscape as articulated by Meinig, emphasised by Cosgrove and reported by Wylie. It is not just that our brains have evolved as a result of a dynamic interaction with our environment, but that the way in which they have evolved also reflects this. In his ground-breaking study of the structure of the brain and its influence on Western cultural history, *'The Master and his Emissary'*, Iain McGilchrist focuses on the fact that the evolutionary development of the

Landscape and the Hemisphere Theory: McGilchrist, 2009

Left hemisphere:

Analytic, generalising, features seen separately and in isolation

Right hemisphere:

Holistic, individual, synthetic, understood in context,
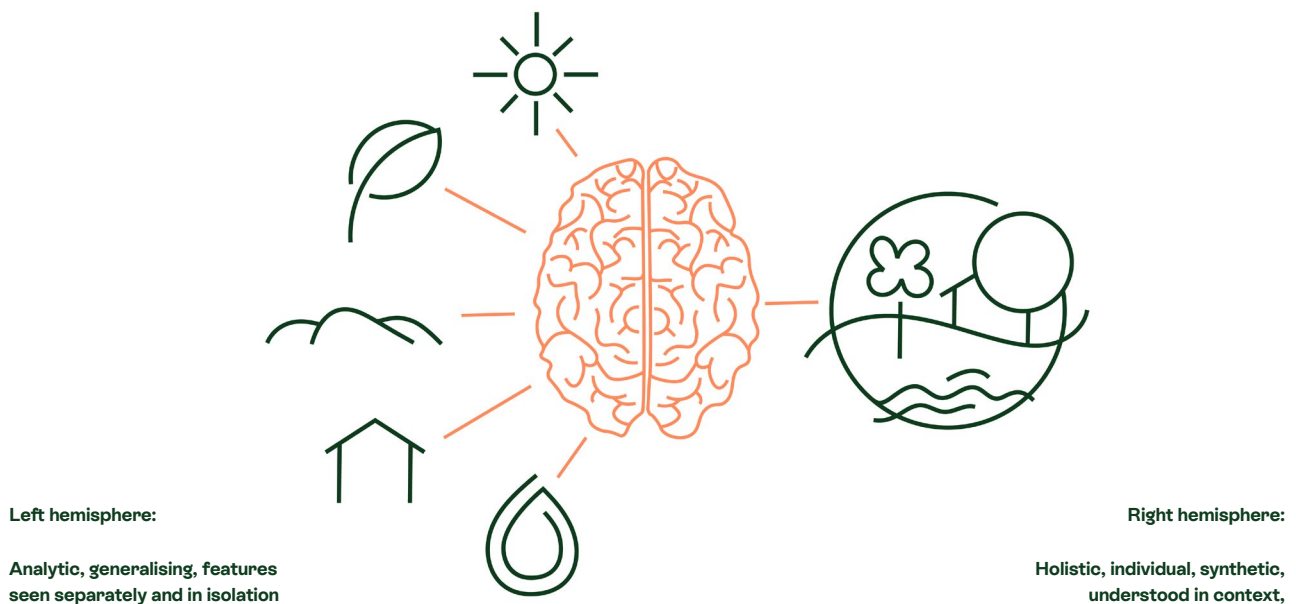
Fig. 5

The two hemispheres of the brain attend to the world in different ways: the left focusses on the details, while the right sees the whole

brain has resulted in it being divided into two asymmetrical hemispheres, each of which has a different way of attending to the world, and thus by implication to the landscapes in which we live (McGilchrist, 2009, 2019). *"There is no such thing as the brain…"* states McGilchrist *"…only the brain according to the right hemisphere and the brain according to the left hemisphere…"* (McGilchrist, 2019, p.175).

According to McGilchrist, what we perceive is a function of the kind of attention we pay to it, and it transpires that the two separate hemispheres of the brain attend to the landscape – and everything else – in different ways (Fig. 5). Whereas the left-hemisphere appears to be responsible for a focussed, analytic, attention to the world in terms of its component parts and their details, the right hemisphere attends to the whole picture and the wider context.

> *"The left hemisphere is always engaged in a purpose; it always has an end in view and downgrades whatever has no instrumental purpose in sight. The right hemisphere, by contrast, has no designs on anything. It is vigilant for whatever is, without preconceptions, without a predefined purpose"* (McGilchrist, 2009, p.174).

These ways of attention correspond closely to the different ways in which the landscape can be perceived: either as a series of isolated objective characteristics which can be analysed separately, studied and put to use, or as an integrated holistic living entity.

The two brain's hemispheres also reflect the two worlds which today's children are facing as outlined in the introduction: the virtual world of the computer screen and the mobile phone, as brought into being by the drive towards digitalisation, and the 'real' physical world outside the window in which the sun shines and the wind blows and where the challenges of climate change and the biodiversity crisis, wait to be addressed. Whereas the way in which the 'virtual' world of the left hemisphere views the landscape is likely to be further reinforced by the onward march of digitalisation, the need to champion the threatened, right hemisphere, world of the real living landscape which provides context and grounding for everything else is paramount, which is where EduScape takes it starting point.

The landscape is thus ideally suited to engage both the hemispheres of the brain, but above all attending to the landscape as the physical setting, the holistic context for learning and living can provide a vital counterbalance and an important complement to the narrow, left hemisphere, focus which will be increasingly emphasised by the digitalisation of learning as it is being currently promoted: landscape literacy as a complement and counterbalance to digital literacy.

All of our landscapes are, therefore, intimately connected in many ways with how each of us as individuals perceives and understands the physical world in which we live. But the landscape does not just relate to the individual, it is also a product of, and home to, human society as a whole. For this reason, landscape as it is currently understood, has wider societal implications as well. This world is, however, at the moment increasingly under threat from a series of significant challenges, in answer to which the United Nations has formulated its 17 Sustainable Development Goals of SDGs, in pursuit of which much national and European policy is directed.

2.4 Landscape at the heart of today's societal challenges

The European Landscape Convention establishes that landscape is not something 'special', only to be experienced at a distance from the everyday world, but rather is ubiquitous and covers the whole territory of each signatory state. Because the Convention recognises that landscape is to be found as is important everywhere, it automatically forms the spatial arena within which most, if not all of today's societal challenges manifest themselves. As the landscape forms the physical environment in which we live, it is perhaps most obvious that it is the challenges to the environment which are embodied in the landscape. These are above all climate change and the biodiversity crisis, which are not just critical in themselves, but also have knock-on effects across many other areas from food security to flood protection.

The landscape is, however, equally somewhere in which societal challenges in the social and cultural fields are also played out. Given that landscape can be understood as being at the intersection between people and place, this ought not to come as a surprise. Consequently, challenges such as social inclusion and heritage and identity are also manifested in the landscape arena. And because landscape is where so many societal challenges manifest themselves, it is also the medium in which most political, economic, social and environmental policies which are designed to address these, are played out. As such, it provides a potential unifying element which can bring together and inter-relate many areas of what are today still separate areas of both European and national policy.

Attention was drawn to this fact in a policy document published in 2010 by the European Science Foundation together with COST (the European organisation for Cooperation for Science and Technology). This was itself a further response to the European Landscape Convention, and recognised the rising importance of landscape, this time as a topic for academic research and scholarship across many disciplines. This recognition took the form of Science Policy Briefing with the title: *'Landscape in a Changing World: Bridging Divides, Integrating Disciplines, Serving Society'* (European Science Foundation, 2010).

The central role of landscape in addressing the broad range of today's societal challenges is highlighted by the European Science Foundation and COST's Science Policy Briefing in which they emphasise that: *"The major grand challenges facing our society are embedded*

in landscape: climate change, energy needs, health and safety, food security, urbanisation and migration".

The policy briefing explicitly emphasises the way in which the concept of landscape can 'help with many of the challenges facing 21st century society' and elaborates on these to include: 'urban and rural transformation, post-industrial revitalisation, increasing mobility, demographic and lifestyle changes and the human contributions and responses to climate change, including the aim of carbon neutrality and the new 'low-energy' landscapes that will emerge'. These challenges, the document says, "call for the development of new forms of governance, and they connect with concerns over food security, heritage, habitat fragmentation or biodiversity; landscape perspectives can contribute a human focus to all these."

Because of its complex nature as the outcome of the interaction between people and place, nature and culture, between society and its physical, mental, social and cultural environments, landscape is obviously very diverse, and can be thought of as varying along different axes. This means that not all societal challenges manifest themselves or are equally expressed in all areas. Variation takes place according to the degree of human intervention, along what can be termed and 'urban – rural' axis; along an axis determined by scale, which stretches from the local to the regional and beyond; and between the extremes of subjectivity and objectivity along a third axis. These three axes can be thought of a defining a three-dimensional 'landscape space' within which the various societal challenges can be located (Fig. 6). This also makes clear the fact that the idea of landscape relates not only to what would normally be considered as 'environmental' challenges, but also to those which are more usually regarded as social problems.
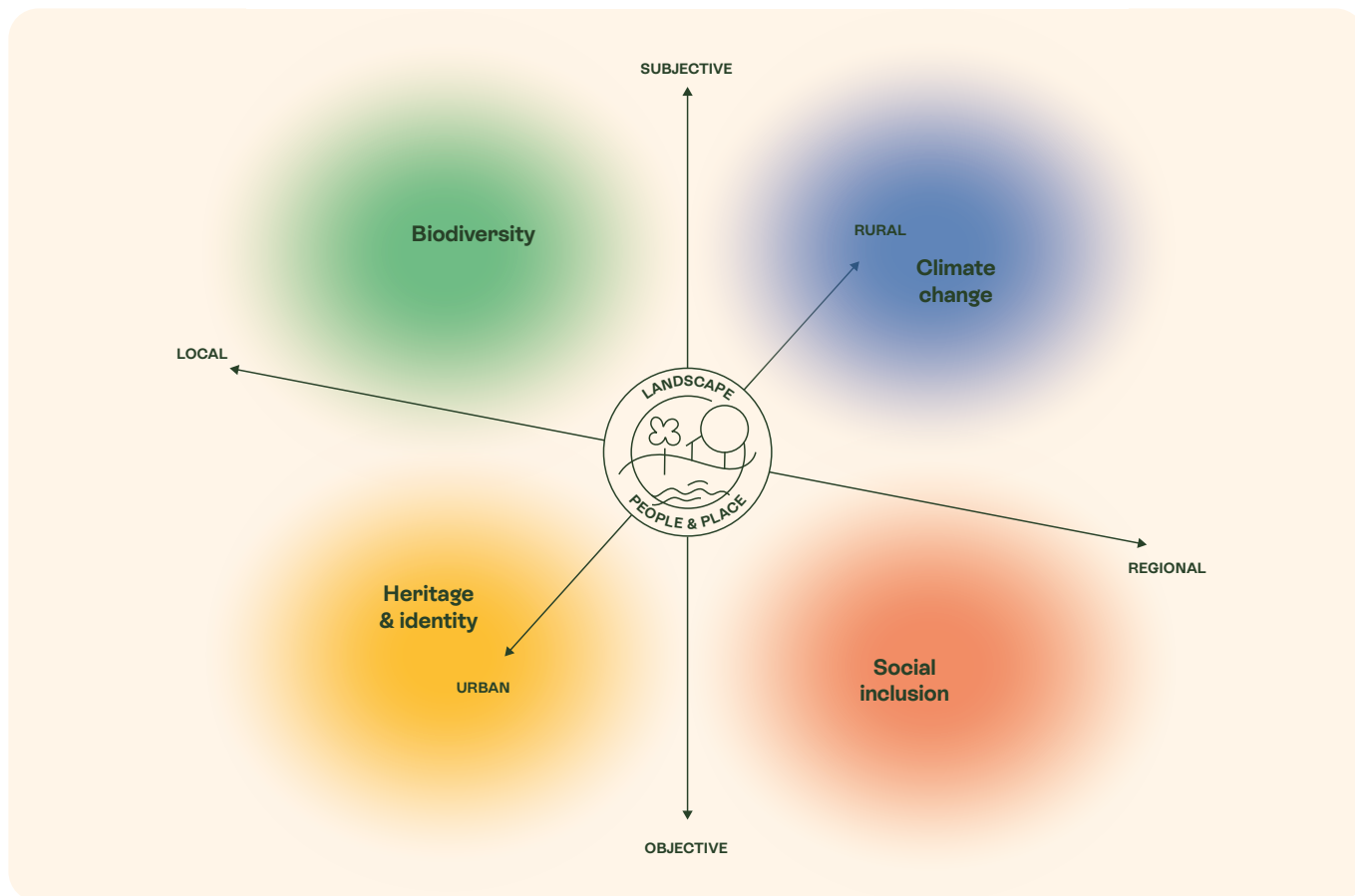
Fig. 6

Dimensions of landscape showing how the relate to today's societal challenges

Each societal challenge generates the need for an appropriate policy response. These may be local or national, but given the fact that the major challenges with which all societies are faced are largely international, if not global in nature, a corresponding policy response is called for. Many key areas of European Union policy[12] – not just those relating to the environment – are intended to address these challenges, and a landscape-focussed understanding of them provides an ideal means of integrating these, often fragmented approaches.

At the global level, the United Nations Sustainable Development Goals[13] provide the necessary framework for such a global policy response (Fig. 7). By integrating people and place, the potential for landscape to act as a common factor linking, not just for a large number of societal challenges, but also the responses to them in the form of the SDGs, makes it of vital importance in helping to address these.

12   https://commission.europa.eu/strategy-and-policy_en
13   https://en.unesco.org/sustainabledevelopmentgoals

Fig. 7

Most of the 17 United Nations Sustainable Development Goals have a strong spatial, and therefore, landscape basis

Helping to address challenges to which the global Sustainable Development Goals are intended to provide a response is a key task for all of humanity, and so it is essential that these form a vital part of the school curriculum in order to equip the coming generations to meet them. It also brings into focus the need for children and young people to acquire an understanding of the landscape – and especially 'their' landscape – as a key part of the school curriculum, and not just as abstract concepts but as lived experience.

Towards a didactical framework for „teaching through landscape"

Intro

Part three of the Methodology will illustrate how today's expanded concept of landscape, as described above, can be developed and applied as a basis for teaching and learning. It can be used, not just to address the immediate characteristics of the environment as familiar from environmental education, but many aspects of the school curriculum.

3.1 Theories of education in relation to the concept of landscape

Teaching describes the art of designing and structuring processes of learning. Therefore, teaching constantly faces three fundamental challenges:

- **what to learn / teach?** (the question of selection of contents),

- **why to learn / teach these** contents? (the question of relevance), and – then –

- **how to learn / teach them?** (the question of teaching and learning methods).

While all three questions are – of course – closely interlinked, they deal with different aspects of a problem that is also investigated by different specialist disciplines. The what and particularly the why to learn is first and foremost subject of educational sciences, developing their insights and conclusions from a philosophical starting point, embedded within the societal structures and values they are part of (see 3.2). The question of how to learn is an issue of learning theories that build their conceptions upon empirical findings within learning-teaching research, which again
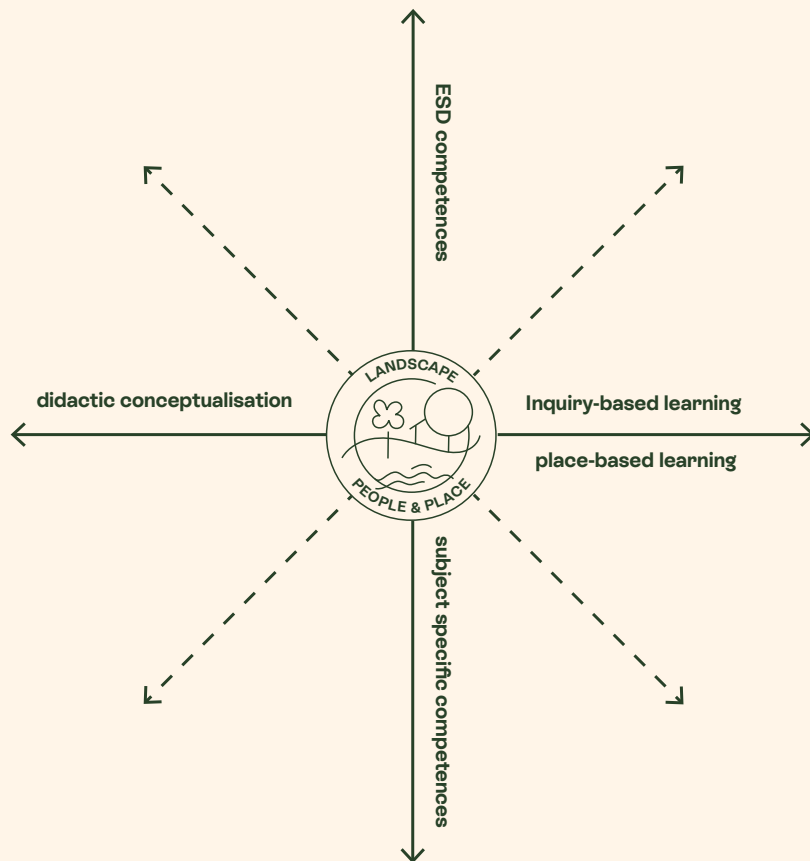
Fig. 8

Landscape forms the starting point for didactic approaches based on inquiry-based and place-based learning as well as for competence-orientated education

is founded upon disciplines as neurobiology, behavioural research and brain research. Their aim is to find out about efficiency and sustainability of learning processes, in order to design and adapt them to the learners' requirements and (individual, but also societal) resources (see 3.3 and 3.4).

All the three aspects can be linked to landscape and its relevance as a learning environment. In the following, we start with the role of landscape in deciding what and why to learn, and then move on to the question of how landscape – as both a tangible locality and as a concept – can support ways of teaching and learning. The central argument is that landscape relates to certain methodology of teaching that can be described as holistic, integrative and – in a broader context – as critical-emancipatory education (cf. Schmied-Kowarzik, 2019). Landscape – as a "way of seeing" (Cosgrove, 1984) – encourages an integrative and interdisciplinary, problem-related approach to deal with all kinds of questions regarding the relationship between humans and their environment(s) in both practical as well as theoretical dimensions. Therefore, landscape is to be seen as a central category in educational sciences as well as functioning as a basic learning environment for applied didactics and learning theories (Fig. 8).

3.2 Today's societal challenges at the heart of education

"Education can be thought of as the transmission of the values and accumulated knowledge of a society" (https://www.britannica.com). *Or, as the online-encyclopaedia Wikipedia puts it, Education can be defined as "the transmission of knowledge, skills, and character traits"* (https://en.wikipedia.org). Education does not take place in a vacuum, but is embedded deeply within a societal context. Although all societies are to some extent different, within Europe in a globalised world there are important common features, the most critical of which are those often described as the global challenges, to which we are all subject. It is to tackle these that the United 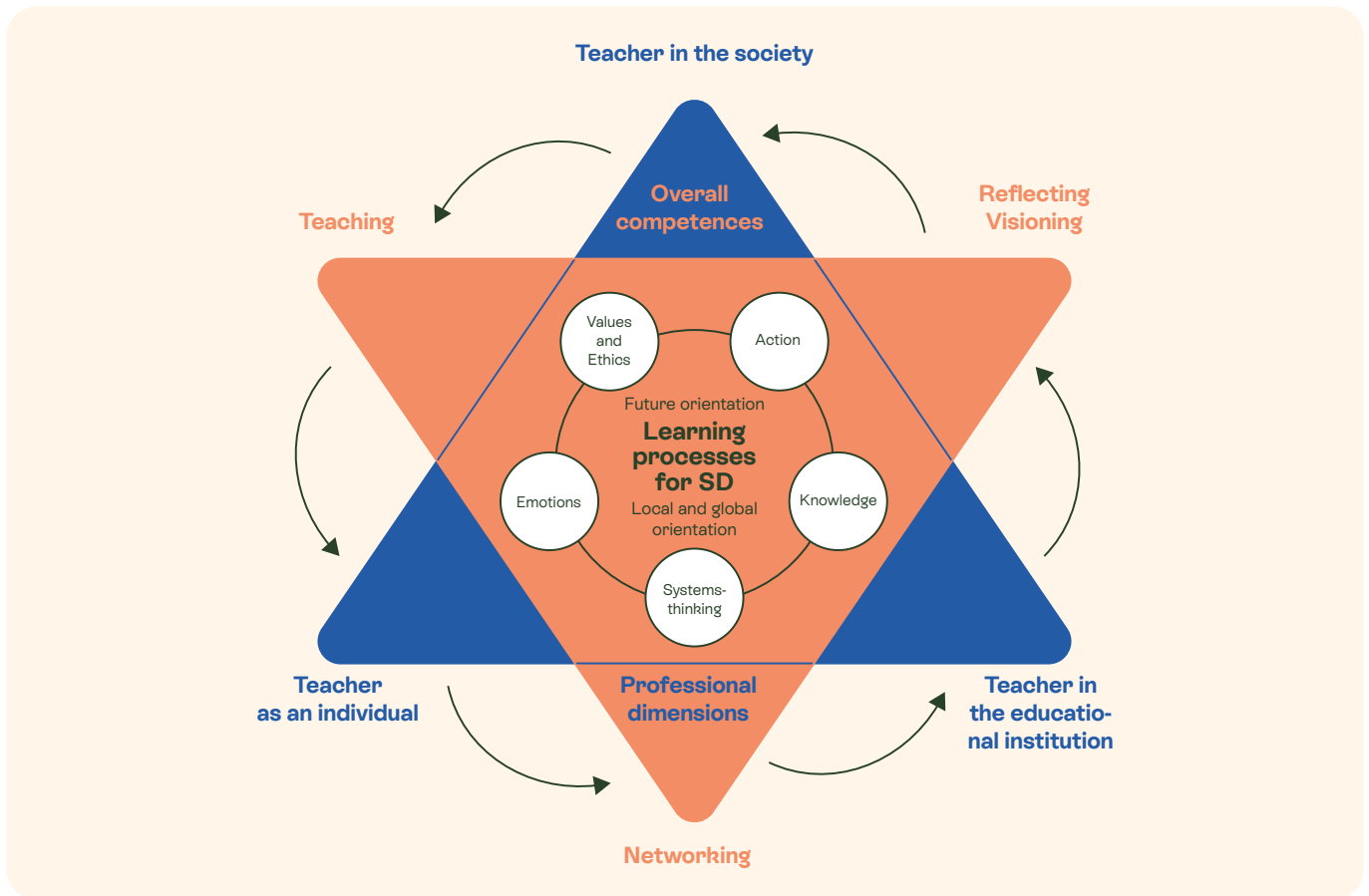Nations have defined their 17 Sustainable Development Goals (SDGs), and in response to which most European Union policies are directed.

Wolfgang Klafki, one of the leading educational specialists in the German-speaking world, has focussed on a definition of the tasks and goals guiding a general education (Klafki, 1993, 1994). He discusses this issue as one of the key central problems of the discipline of didactics (cf. Koch-Priewe, 2007) and, in this context, has coined the term *"epochaltypische Schlüsselprobleme"*, which can be translated as "key contemporary societal challenges". According to Klafki, these key challenges include topics such as peace, the environment, life in one world, the impact of technology and its consequences, democratization, the fair distribution of global resources, equal rights/human rights and the ability to be happy. Didactics and learning arrangements – to be of relevance for the learners – should identify and address at least one of these challenges. They form the core of what Klafki calls the didactic analysis: a framework of criteria to select teaching contents and to decide how to present them to students and shape learning processes.

It seems self-evident that there are strong analogies and parallels between the *"epochaltypischen Schlüsselproblemen"* – the key societal challenges – and the 17 Sustainable Development Goals of UNESCO, that function as guidelines for education (in addition to one of them: SDG 4 which calls for high quality education that functions as an instrument to achieve the other goals). When taking a closer look at the SDGs, we that most of them are closely related to spatial issues. The challenges addressed in the SDGs find their (material) expression in land- (and sea-) scapes as the physical arena in which they are played out. This is true whether they concern environmental challenges (water, biodiversity,

climate change etc.), economic development (energy, infrastructure, urban development), physical, mental and social wellbeing (health, nutrition etc.) or the various dimensions of social justice. For all these challenges landscape is the arena in which they have to be met, and so it surely is not an overstatement to position landscape in the heart of all societal challenges. Or – as Don Mitchell has stated: landscape is the arena in which society' conflicts and struggles over material and symbolic resources take place. These include the distribution and use rights of public space, but also the question, what is considered beautiful or ugly within an environment or what is defined as part of the local identity of a place (Mitchell, 2000). Here, the duality of landscape comes into play: If landscape is not just a concrete place, but also a "way of seeing" – as suggested by Cosgrove (or "an area perceived by people" as put by the ELC) – then these ways of seeing also have to be critically scrutinized with regard to how they become structured through social relationships, ideas and ideologies.

This makes landscape – in its various spatial and local/regional dimensions – an appropriate starting point for examining societal challenges, but beyond that, a medium through which to get involved in those challenges and, in the broadest sense of learning – to find one's own` position in this landscape (for example in relation to questions of social justice, as Mitchell reminds us). Consequently, landscape can be seen as the ideal, if not the pre-destined learning environment to develop awareness and an understanding for the "societal key challenges of an era".

Teacher in the society

Overall competences

Teaching

Reflecting Visioning

Values and Ethics

Action

Future orientation
Learning processes for SD
Local and global orientation

Emotions

Knowledge

Systems-thinking

Teacher as an individual

Professional dimensions

Teacher in the educational institution

Networking

3.3 Landscape and the concept of competence-orientated education

Fig. 9

Model for ESD competences (Sleurs, W. Competencies for ESD, Cited in: Bertschy et al., 2013)

Modern pedagogics focus in their theories and concepts on competence-orientated education. The background is a shift in perspective from teacher- to student-centred approaches to teaching that aim towards a stronger emphasis on individualisation of educational processes. Competences describe the knowledge, skills and qualifications that enable a person to act in a self-organised way in unknown, ill-structured and open-ended situations (Kahlert, 2001; Erpenbeck & Rosenstiel, 2007; Tauritz, 2016). The focus of competence-orientation in education lies in strengthening the personal autonomy and emancipation of learners, in order to help them develop abilities to plan their actions in an increasingly complex world, but also to critically reflect the consequences of those actions. The goal of competence-orientation is to educate mature, responsible and resilient citizens, able to act and able to take criticism (Weinert, 1999).

Several competence models have been developed, for single school subjects and for curricula, but also for environmental education and for education for sustainable development (cf. De Haan, 2008, see also Fig. 9).

In the context of competence-orientated education, landscape functions as a conceptual framework as well as a learning environment that allows, if not demands the development of problem-orientated teaching- / learning arrangements connecting to real-life situations and personal involvement. Landscape represents the complexity of the "real world" (*"problem-based"*), but also its concreteness and accessibility (*"place-based"*). The process of gaining competence might be described in terms of the following (*"inquiry-based"*) steps:

- identifying problems and challenges;
- generating and organising knowledge;
- gaining insights;
- drawing conclusions;
- developing skills;
- considering, testing and reflecting possible solutions.

Together, these find a possible framing in landscape. An educational approach through landscape contributes to individualisation of learning processes. Not only the fact that every landscape is a complex singularity, but also through the insight, that perception of the reality of landscape underlies subjectivity encourages and demands non-standardised approaches to problem-solving as well as its critical reflexion. In other words, landscape at best may form the groundwork for critical-emancipatory educational processes. This leads us to the third aspect that justifies the introduction of landscape as a teaching- and learning environment.

3.4 Landscape in relation to theories of learning

Current theories of learning build upon the insights of modern neurobiology, brain research and behavioural research. They understand learning as a highly individual process of constructing knowledge. According to constructivist learning theories, knowledge derives from the interaction of an individual with his or her physical and social environments and the feedback received (Hein, 1991; Bada & Olusegun, 2015). Knowledge is the result of the meaningful processing of information that can be remembered and applied over long periods of time (Cranach & Bangerter, 2000). This constitutes the sustainable character of learning processes. Following Piaget, knowledge serves as a tool for coping with life and the environmental conditions it is situated in (Piaget, 1984). Learning – as postulated by constructivism – refers to the absorption of information and the development of knowledge based on individual requirements. Learning leads to a change in existing knowledge structures or to a change in available ideas, that can – in a further context – contribute to changes in attitudes, values and behaviour (Tian & Liu, 2022). Therein, learners do not accept information unchanged from the teacher, but actively construct meanings based on their previous ideas. Teaching can initiate, accompany and support learning processes, but learners have to learn. Thus, the creation of learning environments that enable active engagement with the subject matter is of great importance for productive teaching processes.

Skills and knowledge reach the brain through evolution, experiences in childhood and adolescence, and "normal" learning processes. This takes place via the interconnection of nerve cells. In "normal" learning processes, new connections have to be established and old ones "dissolved". Or – as brain-researchers put it: Every brain is the product of its individual learning history (McGilchrist, 2019).

The brain actively constructs meanings. For this purpose, it saves prototypical features ("rules") from countless detailed information, which enable the classification of new information. As consequences for learning processes it has to be regarded that:

- **Learning is an active process** in which learners construct knowledge based on their experiences (prior knowledge, mental structures, beliefs).
- In **assimilation learning, new categories are added to existing ones,** accommodative learning processes mean relearning and are associated with uncertainty and effort.
- **Lasting knowledge arises in application contexts** when **existing and new knowledge are combined**.
- Since knowledge is in the service of coping with life, it is important to embed **learning objects in contexts that are relevant** for students. And knowledge must prove useful to students.
- Ideas about a topic are shaped by experience. **Physical experiences** (body and environment) **and experiences with language** play an important role. Language is an expression of thinking and acting and at the same time these are influenced by language. Experiences and ideas can be presented and communicated through language (Theory of experience-based understanding).
- Knowledge is **context-related** and generates new contexts in which those involved in the learning process act. The theory of situated learning examines the context dependency of learning processes (cf. Lave & Wenger, 1991). The aim of the contextual model of learning is to use the construction of **learning environments that are as authentic as possible** to initiate qualitatively and quantitatively high-quality learning processes that enable the learners. (Weitzel, 2015)

Deduced from the insights of constructivist learning theories, the following didactic principles may guide the design of learning arrangements (cf. Ruppert & Spörhase-Eichmann, 2010):

Principle of the exemplary:	Exemplary learning is in contrast to "encyclopedic" learning, which is designed to be exhaustive. It aims to limit the material and focus on the essentials (learning from a few selected examples).
Principle of perception and experience orientation:	Direct experiences through outdoor lessons and extracurricular learning locations; building on previous experience and knowledge; linking the known with the new
Principle of action and problem orientation:	Action combines intellectual debate with self-responsible activity. Action contains cognitive elements (consideration, deliberation, planning, process control, evaluation and result evaluation), practical activities (exploring,

manufacturing, building, cultivating, etc.) and, based on reflection, leads to results that can be presented, passed or further processed (models, exhibitions, posters, films…).

In action-oriented lessons, students are involved in the planning process, and the interests of the pupils form the starting point. Problem solving is characterized by processes of thought and action aimed at coping with a situation for which no routine procedure is immediately available (Baumert et al. 2003). Problem-oriented work means that students learn to derive questions and problems from a phenomenon or a topic and to solve them as independently as possible. The phase of finding or defining the problem is of great importance. Action and problem orientation promote professional competence, methodological competence, self-competence and social competence (Allen et al., 1996; Gijselaers, 1996; Barrows, 2005; Weitzel, 2015). Landscape as a learning environment obviously fulfils many of the criteria and principles drafted for constructivist learning arrangements, such as exemplary learning, situated learning, experience-based learning, or problem-orientated learning.

3.5 Learning, landscape and the laterality of the brain

Learning processes are structured and directed by the brain. While information from the outside world is perceived through various channels, the brain processes that information and stores it. Following insights from brain research, the basic structuring of perception – as of experience in general – is managed by the brain's two hemispheres, which are functioning in fundamentally different ways (cf. Jaynes, 2000; Cavanna et al., 2007). Although the situation has often been over-simplified and misrepresented, it seems established popular knowledge that there exists a pattern of division of labour between hemispheres. According to this popular version, the left hemisphere is responsible for rationality, analytical thinking, speech and the processing of serial information and abstract data, while the right hemisphere is the place where emotions, creative and divergent thinking, identification and processing of holistic, nonverbal information and understanding for metaphor, interpretation and context are processed (cf. Fiore & Schooler, 1998; Faust, 2012). Brain research locates the origins of that division within evolution, matching the left hemispheres` achievements in focused attention (required e.g. in searching for food or manufacturing tools), while the right hemisphere's abilities lie in open attention, sensitive for social group interaction as well as alertness against enemies and potential threats. Or, as Ian McGilchrist puts it in a more metaphorical framework:

> "On the one hand, there is the context, the world of 'me' – just me and my needs, as an individual competing with other individuals, my ability to peck that seed, pursue that rabbit, or grab that fruit. I need to use, or to manipulate the world for my ends, and for that I need narrow-focus attention. On the other hand, I need to see myself in a broader context of the world at large, and in relation to others, whether they be friend or foe: I have a need to take account of myself as a member of a social group, to see potential allies, and beyond that to see potential mates and potential enemies. Here I may feel myself to be part of 'something' much bigger than myself, and even existing in and through that 'something' that is bigger than myself – the flight or flock with which I scavenge, breed and roam, the pack with which I hunt, the mate and offspring that I also feed, and ultimately everything that goes on in my purview. This requires less of a wilfully directed, narrowly focussed attention, and more of an open, receptive, widely diffused alertness to
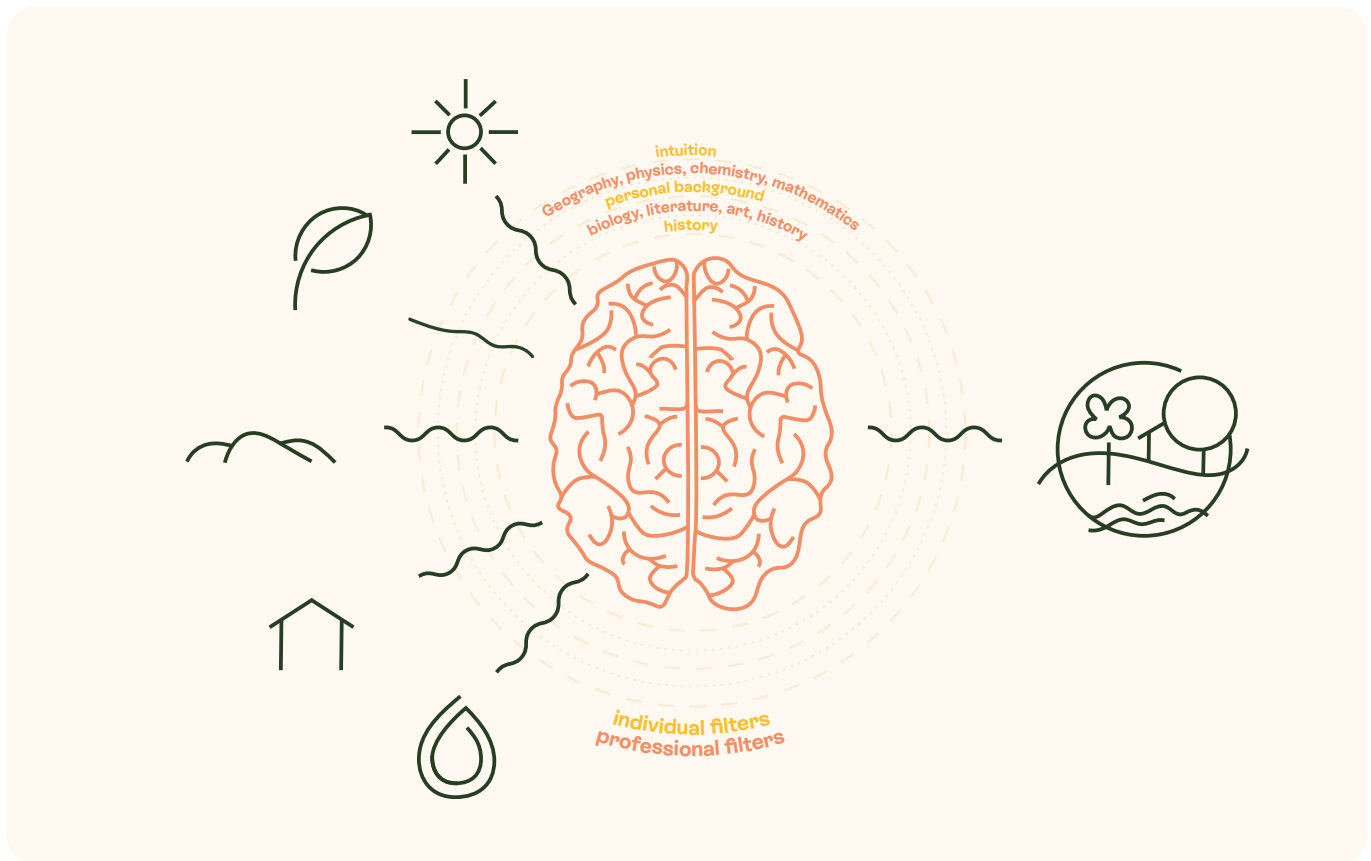
Fig. 10

The various filters that organise perception

whatever exists, with allegiances outside of the self. These basic incompatibilities suggest the need to keep parts of the brain distinct, in case they interfere with one another" (McGilchrist, 2019: p.25)

However convincing that image of the bicameral brain and its functional segmentation might be, McGilchrist (2019) points out, that it's the cross-linkages between hemispheres and their synergetic functioning (rather than separated modules) that makes the strength of the bicameral brain. And beyond this, McGilchrist teaches us in The Master and his Emissary: The Divided Brain and the Making of the Western World, the relationship between hemispheres is an asymmetric one: While the left side of the brain, serves in the processing and storing of data and information perfectly well, it is the right half that gets the "big picture" by identifying patterns, drawing connections and integrating things in context. It is also responsible for the phenomenon of empathy, for linking our experiences and information on concrete subjects, environments and places with emotions. Deficits in the right hemisphere may lead to mechanistic, reductionist, fragmented, decontextualized and emotionally distant world views. Nonetheless, McGilchrist claims, cultural evolution over the century or so has reflected a prioritisation of the qualities of the left hemisphere (and its abilities of processing and analysing abstract, serial data).

Emphasis on digitalisation can be seen as the latest step in the direction of a virtual, left hemisphere-orientated worldview.

One of the key arguments directing the EduScape project demands that sustainable learning processes have to actively and purposely engage both hemispheres of the brain. Starting from the insight that the right hemisphere is a) more sensitive to environmental influences; b) creates empathy towards the living sphere; c) shows awareness for the whole and for relationships between its part and d) is able to link knowledge and experience with (positive) emotions (McGilchrist 2019, pp. 56, 65) – it seems more than obvious to support right-hemisphere-conducted processes of learning in an equal way to those located in the left one. Landscape as the "natural" everyday environment therefore – again – provides for the adequate surroundings, just as long its holistic dimension of "Gestalt" is regarded as being equal in significance to the analytic approach towards the single elements of which it is composed (Fig. 10).

3.6 Landscape as a spatial framework for teaching and learning

In order to play its role as the central medium for teaching and learning, landscape needs to be easily available to both teachers and learners in terms of accessibility, but is also needs to meet a wide range of criteria in order to fulfil the needs of different subject areas. It clearly meets the first criterion as it has already been established that landscape covers the whole territory of a country and encompasses urban and peri-urban areas as well as rural and natural landscapes. Because more than two thirds of Europe's population live in urban areas, this is important as it means that landscape forms the spatial context for all schools. Although taken together urban and peri-urban landscapes still form only a relatively small proportion of each country's surface area, as far as schools are concerned, however, they are the most common spatial setting.

Wherever schools are located, they can therefore provide a basis for teaching and learning through the landscape. The urban-rural axis in figure 5 therefore provides a scale on which the location of any school can be positioned. As the European Landscape Convention makes clear, however, this scale also includes relatively rare natural landscapes as well as the much commoner peri-urban ones. Perhaps counter-intuitively, because landscape is the result of the interaction between natural and cultural factors, urban and peri-urban landscapes provide as least as rich a spatial framework for using landscape as a medium for education as do rural and natural ones. What might be called into question, however, is the extent to which they have the necessary variety to accommodate their use for teaching and learning in all the conventional school subject areas. However, as Donald Meinig (1979) has noted: landscape is also as much to do with what is in our heads as it is with what lies before our eyes, and thus the same spatial framework which forms the landscape setting for any school will be seen and interpreted differently by different observers.

This echoes what Iain McGilchrist says about how the way in which one attends to the world – or a landscape – determines what one finds (McGilchrist 2019, pp 133ff), and this corresponds to the role of the 'beholder's share' as defined by Ernst Gombrich. Meinig also drew attention to this very fact in his essay 'The Beholding Eye: Ten Versions of the Same Scene', originally published in 1976 (Meinig 1979 pp 33ff). Here he outlined ten different ways in which a diverse group of observers could view a particular landscape. These encompass:

- **Landscape as nature,**
- **Landscape as habitat**
- **Landscape as artefact**
- **Landscape as system**
- **Landscape a problem**
- **Landscape as wealth**
- **Landscape as ideology**
- **Landscape as history**
- **Landscape as place**
- **Landscape as aesthetic**

This variety of viewpoints and interpretations reflects the different ways in which individuals, each with their own personal history and perspective, can view a similar landscape in contrasting manners, through their own 'filter'. But other types of filter are also possible when we consider a landscape – namely 'professional' filters such as those attuned to the requirements of a particular school subject. Thus, these different observers can also be thought of as corresponding to the representatives of different school subject areas, each of which can be expected to have their own specific 'gaze'. Consequently, the same landscape surroundings of a school can be equally although differently viewed through the lenses of history, geography, chemistry or biology, or indeed any other area of teaching and learning.

Although the landscape context of any school can act as the necessary resource for all forms of teaching and learning, the specific location of the school and whether its immediate or wider surroundings are considered, will provide a wide range of opportunities for different approaches, whether they are in urban, rural or peri-urban situations. The immediate context of the school, perhaps within walking distance, might be more appropriate for working with younger children, while the wider region within which the school is located could open up further perspectives for teaching and learning with older age groups.
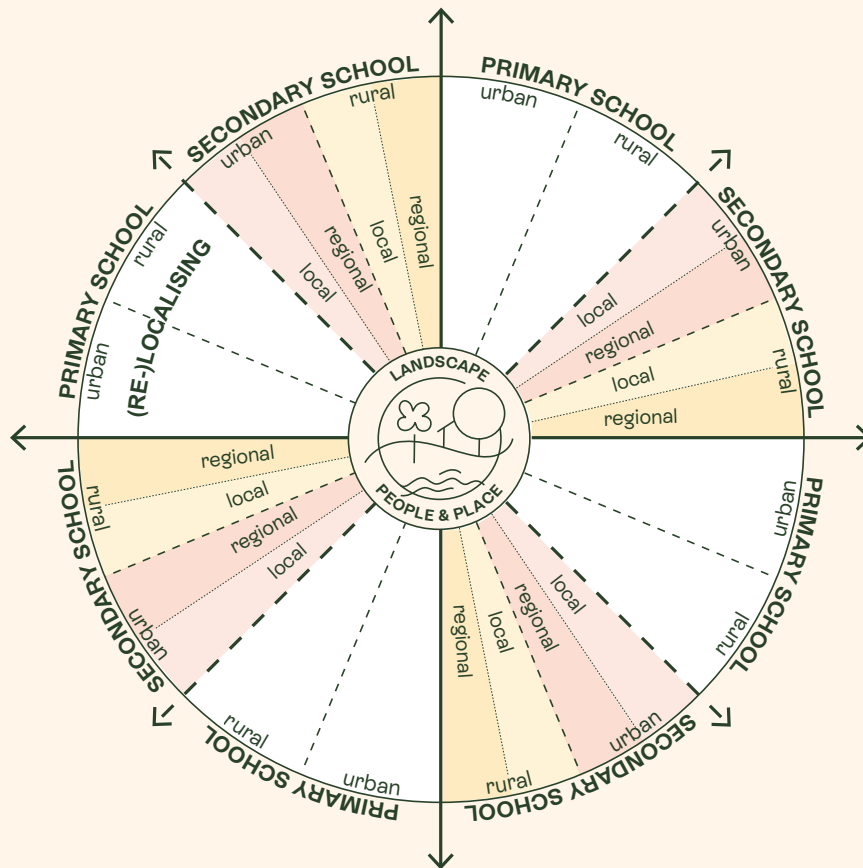
Fig. 11

The location of different types of school in different geographical situations offers a wide range of opportunities for landscape-based teaching and learning

Clearly the range of possible school contexts within which landscape-based teaching and learning will take place provides both challenges and opportunities for those concerned, but this is inherent in the nature of any form of place-based learning approach (Fig. 11). The advantages will mean that lessons can be more immediate and topical and above all rooted in the local community

Landscape as an over-arching theme for educational units

4.1 Landscapes in environmental education: The story so far and how to develop it

Tab. 1

Didactic approaches adopted in the field of environmental education

The field of environmental education is well established and a vast wealth of experience and literature exists with regard to how environmental issues can be introduced into both formal school education and to the informal education of school-aged children. In the field of environmental education, a multitude of approaches to teaching with a great diversity of methods and materials has been developed. These range from the experience-based "flow-learning"-concepts introduced by J. Cornell (1989), through diverse approaches applying discovery learning and inquiry-based learning in nature, to several variations dealing with conceptions of place-based learning (see Tab. 1) – not to forget the rich tradition of the school garden movement throughout Europe from the 19th Century. Landscape in that context plays an important role, either explicitly when referred to as the medium through which environment (or environmental problems) finds

Methodological concept	Characteristics/ Principles	Theoretical background/ didactic Goals	Connections to Landscape
Flow theory – learning through experience in and with nature (Joseph Cornell)	"First look and experience, then speak" 1. Awaken enthusiasm 2. Perceive in a concentrated manner 3. Direct experience 4. Let others share your own experiences	Flow learning provides opportunities to develop positive emotions for nature or a place	Starting point to landscape perception
Discovery learning; Inquiry-based learning	Learning circle: Exploration – Invention – Application Circle of Inquiry-based learning: 1. Observation 2. Research question 3. Hypothesis 4. Planning of research design 5. Carrying out 6. Analysis and interpretation	Discovery learning encourages students to self-directed, self-paced investigations and strenghtens intrinsic motivations; Inquriy-based learning helps to develop a scientific perspective and scientific ways to gain knowledge	Starting point to explore and investigate processes within landscapes
Problem-based learning; Problem-orientated learning (eg. John Dewey)	1. Examination and definition of the problem 2. Exploration of existing knowledge related to the problem 3. Determination of what has to be learned about the problem and where to gain the tools and the necessary knowledge to solve the problem 4. Evaluation of possible ways to solve the problem 5. Solution of the problem 6. Report on the findings	Students learn about a subject by working in groups to solve an open-ended, ill-structured problem. This problem is what drives the motivation and the learning. Students develop flexible knowledge, problem-solving skills, self-directed learning skills and collaboration skills.	Starting point to investigate challenges and problems regarding landscape or finding their expression in landscape eg. Climate change, societal challenges

Place-based learning; Service learning	Place-based learning/service learning combines social commitment/ engagement of students with subject-related learning and cognitive learning with taking on responsibility in the school environment (service).	"Place-based education might be characterized as the pedagogy of community, the reintegration of the individual into her homeground and the restoration of the essential links between a person and her place" (Laurie Lane-Zucker 2004).	Landscape in its individuality and identity forms the learning environment as well as the subject for place-based learning
Transformative learning (Jack Mezirow)	Transformative learning focusses on a process of "perspective transformation" envoling three dimensions: 1. psychological transformation (changes in understanding of the self) 2. convictional transformation (revision of belief systems) 3. behavioral transformation (changes in lifestyle) (Clark 1991)	"Place-based education might be characterized as the pedagogy of community, the reintegration of the individual into her homeground and the restoration of the essential links between a person and her place" (Laurie Lane-Zucker 2004).	Landscape in its individuality and identity forms the learning environment as well as the subject for place-based learning

an expression, or more implicitly, when certain parts or elements of landscapes are discussed. It is not possible to review the broad body of concepts on environmental education here, but this is not a problem as most of it focusses on teaching and learning about the natural world in a largely rural or naturalistic context, and is not about the broader concept of landscape with its associated social and cultural aspects. Environmental education can, however be seen as a particular sub-set of education about landscape, as environmental issues such as biodiversity and climate also have an important place within the field of landscape.

As such environmental education has an obvious intersection with school education in the fields of biology and geography, but does not touch on many of the wider aspects relating to the "key contemporary societal challenges" as embodied by the United Nations 'SDGs'. This narrowing of focus that can/could be observed in environmental education is obviously not the case in the field of "Education for sustainable development (ESD)", which may be seen as the logical advancement of environmental education (cf. Wolf, 2005; Steiner, 2011; Bolts, 2014). ESD, with its broader angle in societal, economic, cultural and ecological issues and challenges may also appear suited to the comprehensive landscape concept introduced by the European Landscape Convention.

Conversely, the introduction of the theme of landscape as an explicit topic within the field of teaching and learning for school-aged children, and distinct from the broader theme of environmental education, dates broadly from the initial adoption of the European Landscape Convention by the Council of Europe's Committee of Ministers in 2000. Article 6 A of the Convention calls explicitly for signatory states to raise awareness of the importance of landscape within civil society in general, and according to Article 6 B, each party to the Convention *undertakes to promote school and university courses which, in the relevant subject areas, address the*

values attaching to landscapes and the issues raised by their protection, management and planning'.

One pioneer in supporting landscape teaching in schools has been the Catalan Landscape Observatory, established in 2004 to advise the Catalan government in matters relating to landscape and to support the implementation of the European Landscape Convention. Amongst other things, the Landscape Observatory has published the results of an international seminar on 'Landscape and Education', held in 2009 together with the Council of Europe (Nogué et al. Eds., 2011). This presents a range of papers and some project examples…

The Council of Europe itself has since published its own pedagogical booklet: 'Landscape Education Activities for Primary Schools' (Council of Europe 2021). This is, first and foremost, a collection of activity sheets aimed at arousing pupils' curiosity and interest in landscape.

These initiatives are of considerable interest for the EduScape project and provide an important foundation, but they differ fundamentally from its goals, which are wider and more ambitious in that the project is about using landscape as a medium through which to address a far wider range of subjects, which form part of the school curriculum, rather than merely regarding the landscape itself as the object of study in addition to existing topics of study.

Creating hands-on learning processes in the surrounding "real world" outside with first-hand experiences promise to create more sustainable ways of learning than –for example –simply reproducing contents from a book.

Learning and teaching in the landscape

Gaining an improved understanding for landscapes as basis of our livelihood and basis of existence: what shapes them, what threatens them and what they mean for our everyday living, well-being and subsistence.

Learning and teaching about landscape

Learning and teaching through landscape

Utilizing landscapes as a medium through which knowledge and competences in various fields can be generated and which provides example for contents to be taught that are defined in the syllabuses of subjects in school curricula.

4.2 Teaching and learning in, on and through landscape: The basic idea behind the EduScape-Project

Fig. 12

Learning in, on and through landscape

EduScape aims at introducing and establishing landscape as a concept (as well as the broad variety of tangible landscapes throughout Europe) as a teaching- and learning environment in order to promote more sustainable teaching and learning processes in school education. Learning in/with, on and through landscapes (Fig. 12) covers the following dimensions:

A. Gaining an improved understanding for landscapes as basis of our livelihood and basis of existence: what shapes them, what threatens them and what they mean for our everyday living, well-being and subsistence. This is the dimension of learning on landscapes.

B. Utilizing landscapes as a medium through which knowledge and competences in various fields can be generated and which provides example for contents to be taught that are defined in the syllabuses of subjects in school curricula. Landscape therefore is to be seen as something like a learning laboratory. This is the dimension of learning through landscapes.

C. c) And third, creating hands-on learning processes in the surrounding "real world" outside with first-hand experiences promise to create more sustainable ways of learning than – for example – simply reproducing contents from a book or some digital media. This is the dimension of learning in and with landscapes.

At best, a learning sequence links all three dimensions with one another. For getting started to introduce landscape to teaching, we developed a framework that may function as a first compass for choosing topics, defining teaching goals, deciding on the level and depth of engagement and for selecting teaching materials. Features such as the age group of children, topics and contents defined in school curricula regarding different subjects as well as time budgets, preferred teaching methods and teaching formats, the individual situation of teaching conditions and – last not least: the location of a school and the qualities of surrounding landscapes – function as criteria for the development of teaching units on, through and with landscapes.

Conceptualising

Perceiving
- Exploring aspects
- Investigating perspectives
- Considering approaches and methodologies

Analysing
- Collecting data and „mapping the field"
- Identifying patterns and contradictions
- Drawing conclusions

Shaping
- Experimenting and generating ideas
- Suggesting and testing practices
- Assessing possible solutions

Reflecting
- Re-organising knowledge
- Re-considering attitudes
- Transforming ideas and values

4.3 The EduScape Unit concept: Sketching a didactic roadmap for teaching/learning processes

Fig. 13

Stages in teaching on and with landscapes

Teaching on, with and through landscape can take place on different levels of involvement, incorporating distinguished methodological approaches with different didactic goals. We describe these within a developing model incorporating five stages of engagement (Fig. 13).

Ideally, a unit starts with **conceptualising** a topic. This means, learners are introduced to the topic, they are confronted with possible problems or challenges that go along with it and they are encouraged to activate existing knowledge and pre-conceptions on the topic. In that stage, basic knowledge as well as scientific terms and concepts can be introduced. Learners should be enabled to grasp the relevance and importance of the subject. Landscape, at that stage of involvement, may function as a medium to link the issue to the everyday environment and experience of the learners.

Under the heading of **perceiving**, all activities of exploring and investigating a topic through empirical perception are summarized. Perception describes the crucial processes of connecting a subject with one's own experiences and getting personally involved with it. All kinds of perception (observation, but also acoustic, olfactory, tactile and taste perception) form the groundwork for drafting assumptions on phenomena, questioning their reasons and phrasing hypotheses on possible connections and

contexts. Perceiving may also challenge the investigation of different perspectives on a subject or phenomenon and consideration of different methodologies for its further systematic inquiry.

This leads to the next step of **analysing**, which describes the field of collecting data on a topic, comparing them and putting them in context with observations, assumptions and theories developed at the stage of perceiving. We call that stage "mapping the field", as it aims at a systematic survey that allows critical validation of all knowledge gathered in the previous steps. Goals of analysis are the identification of patterns, but also of possible contradictions or further problems that characterize the investigated topic, subject or field. Ultimately, analysis should end with the drawing of conclusions that might support practical ideas of solving a problem.

The term of "**shaping**" shall hint to that level of learning, where knowledge is linked to practice. The idea is here, that sustainability of learning processes depends on practical application of the acquired knowledge, competences and skills, to grasp its significance and to consolidate it. Shaping describes processes of experimenting with different ideas, materials and methods, testing of various practices or crafting of practical solutions. Not in every case, learning settings may reach this stage, but it should at least be kept in mind when designing learning environments that shaping – which means, actively participating in the design of our physical and social environments – is a long-term goal of all learning.

Reflecting – contemplation, exchange and discussion of all the previous steps – closes the learning path sketched in our roadmap. Reflection aims at securing the learned, recollecting memory, but also at critically questioning the achieved results. Reflecting focuses on re-organising knowledge and skills, and – on higher levels of learning – on re-considering attitudes and transforming of ideas and values. As reflection forms an essential part of every learning processes, this stage not only forms the concluding element of each EduScape-Unit, but should be incorporated.
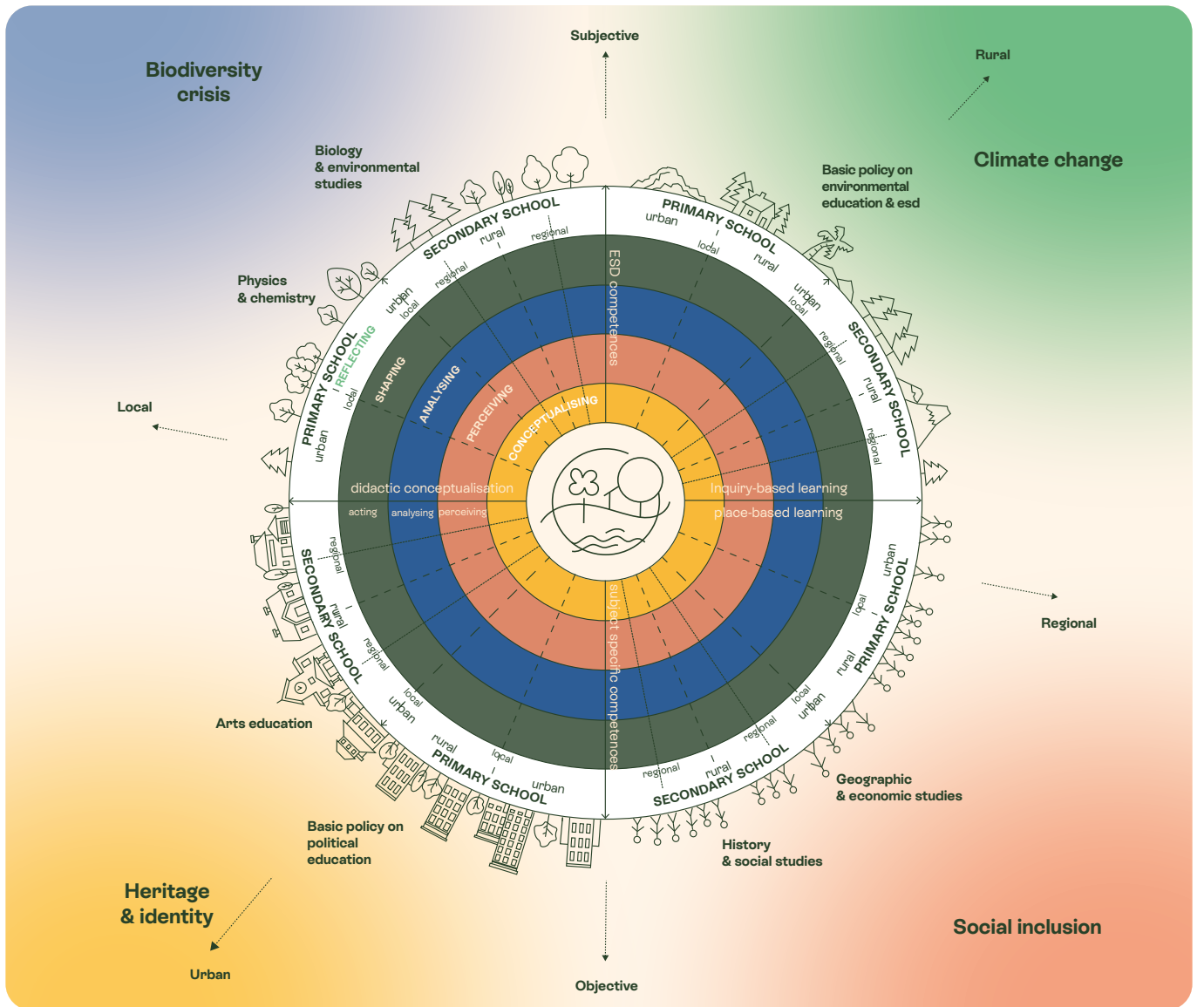
4.4 The EduScape target: A comprehensive model for teaching and learning with landscape

Fig. 14

Roadmap for teaching / learning processes in and with landscape within the wider context of the key societal challenges

To illustrate our understanding of teaching in and with landscape, but also to organise access to the usage of the teaching materials provided the following 'target' diagram shall function as a general guideline (Fig. 14). This is located within the *four crucial fields of societal challenges* that are to be addressed by landscape approaches: *Biodiversity* and *climate change* on the level of the physical environment and social *inclusion* and *heritage/ identity* on the level of the socio-cultural environment. Together, those four challenges cover four quarters of a square that forms the background for all further educational activities. Relating those challenges to curricula and school subjects, we can discover more or less tight (or loose) connecting

points: biodiversity and climate change connect to the "natural" sciences Biology, Chemistry, Physics and – to a certain degree – to (physical) Geography, while social inclusion and heritage/identity connect to subject as History and Social Studies or Arts Education. Beyond that, we find linkages to cross-sectoral matters such as Political Education, Environmental Education/Education for Sustainable Development or Health Education. This background layer provides orientation for selecting and anchoring topics and lessons within a curricular framework. It is also the basis from which over-arching didactic goals are deduced in order to structure and design educational processes. For example: If we do a learning unit in the field of biodiversity pupils should become aware of the fact, that biodiversity is a feature characterising every landscape, that there are factors that influence biodiversity in positive or negative ways, that human action and behaviour essentially effects it, why this is so, which are the consequences, what could be done about it and so on. As for every good educational lesson, each learning output should take reference to "key contemporary societal challenges".

Against that background, we find a "target" placed in our diagram. At its centre there is "landscape" as a starting point for educational activities, surrounded by concentric circles that define the different levels/stages of activity and didactic involvement of landscape in the teaching/learning process (see section 3.2). If one starts with a landscape-centred approach, elaborating on the landscape concept in any way would be a reasonable starting point, from which one could work along dealing with the didactic steps of perceiving, analysing and so on. Inquiry-based and/or place-based teaching settings that contain a number of learning units would provide feasible frameworks for such approaches. But it is also possible to cut short the process or to start from any arbitrary point within the target, utilising only single elements or sequences of the target model.

Segments of the target distinguish if a topic is fitted for the age of primary or secondary school classes, if it deals with contents on local or on regional level and if it addresses chiefly the rural or the urban landscape. As regional level demands a certain ability for abstraction and is of limited suitability for younger children, we left it out in segment of primary schools. The distinction between "rural" and "urban" might not be compelling in each individual case. However, there certainly are topics that relate more strongly to the built landscape and ones more related to the open, not-built environment, so we keep it as a possible choice.

Landscapes in climate change education: How to use and integrate EduScape into school teaching

Intro

The focus of the EduScape-project lies on taking landscape as a starting point in education relating to climate change and other societal challenges. Landscape is seen as an ideal medium through which place-, experience- and inquiry-based education can be applied in an integrated way. It is in the nature of things that the chosen approach and the topic call for an interdisciplinary and integrated perspective. However, it seems equally important to us, that EduScape (and the developed learning environments and materials) are suitable for use within existing curricular structures and can be connected to traditional subject-based contents. Therefore, the units and materials designed within EduScape take teaching contents and goals as they are defined in curricula as starting points. EduScape aims, not just to fulfil those goals, but also to demonstrate how to achieve defined learning goals in a high-quality approach to teaching and learning, and to refine them by linking them to the highly relevant topic of climate change adaptation and -mitigation. An overarching goal is to support teachers in integrating the highly critical societal challenge of climate change into their teaching.

5.1 Landscape as a starting point in different school subjects

Tab. 14

Landscape in different school subjects

As explained in chapter 4, landscape may function as a starting point for engagement with numerous societal challenges, particularly those with a clear spatial dimension, such as climate change. On the other hand, from a subject-based perspective, the landscape concept can form a common ground for integration between subjects, although each subject might start from its own very specific landscape-conceptualisation. For example, a historic perspective may set different aspects of landscape into focus than biology, chemistry, physics, arts and design or language education.

Table 2 provides an overview on how different subjects may conceptualise landscape; which guiding questions might result from that subject-specific perspective; and where possible linkages to the curricula could be identified. It is important to stress that these different aspects can be found in one and the same landscape as the common arena of experience and learning. Or – to use another metaphor – landscape forms the everyday environment, in which societal challenges manifest themselves.

| Subject	Landscape concept	Possible guiding questions for inquiry	Possible links to curricula
Geography	Landscapes as outcomes of human-environmental relationships	How can landscapes be read as representations of the relationships between humans and the environment?	
History	Landscapes as indications for historical processes	Which evidences for historic changes can be traced within landscapes?	
Language and literature education	Landscapes as sources for human cultural expression	How have landscapes been influencing and inspiring human thought and verbal expression?	
Arts and design	Landscapes as designed environments	In which ways are landscapes designed – and provide inspiration for design?	
Biology	Landscapes as products of the interactions between living and non-living matter	Which are the structures, functions and dynamics characterising ecosystems within landscapes?	
Physics	Landscapes as products of the transformations of energies	How do physical powers and processes, shape landscapes?	
Chemistry	Landscapes as products of the transformations of materials	How do chemical processes, and transformations of materials and energies shape landscapes?	

mathematics   chemistry   physics   geography   history   biology   arts   literature
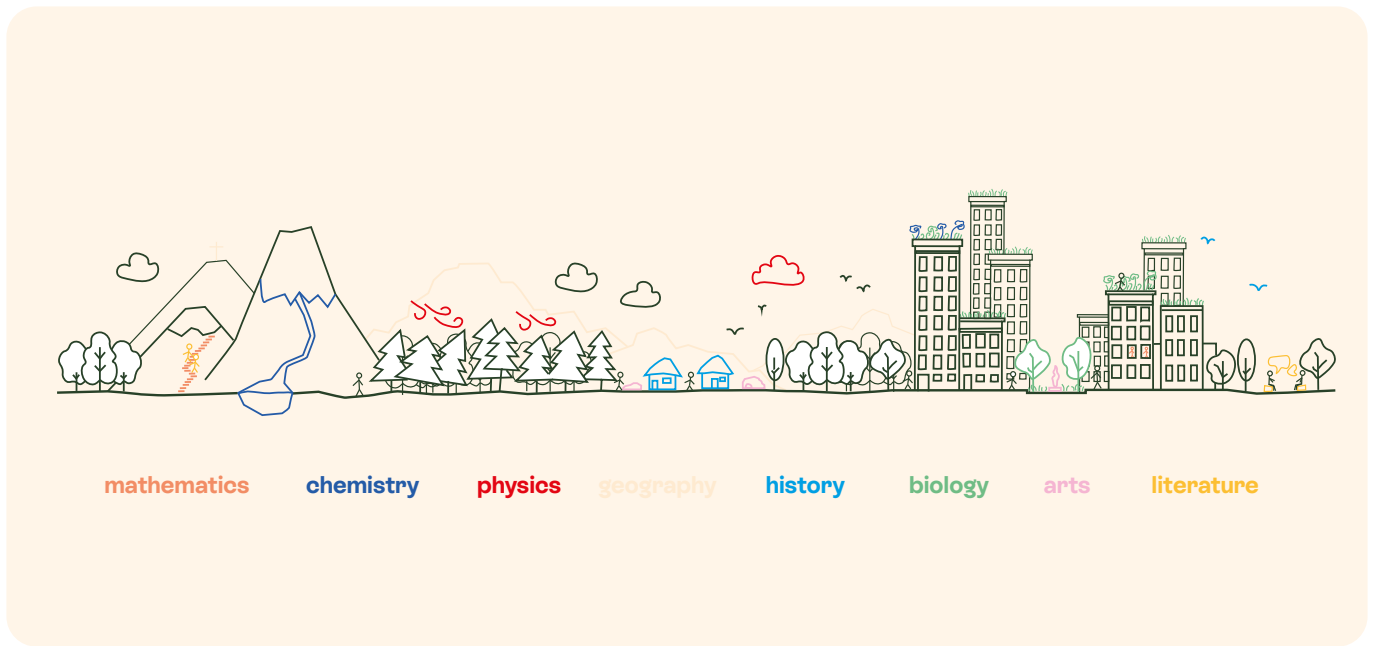
Fig. 15

Perceiving landscape through a school-subject related perspective

Individual subjects structure perception of that landscape in their own particular way (= conceptualising), but still it is the same landscape they look at (= perceiving) and investigate (= analysing), in order to create knowledge and skills for addressing and tackling of societal challenges (= shaping) (see Fig. 15 and Fig. 16). Links between school subjects and societal challenges are to be found in the curricula, which obviously vary from country to country.
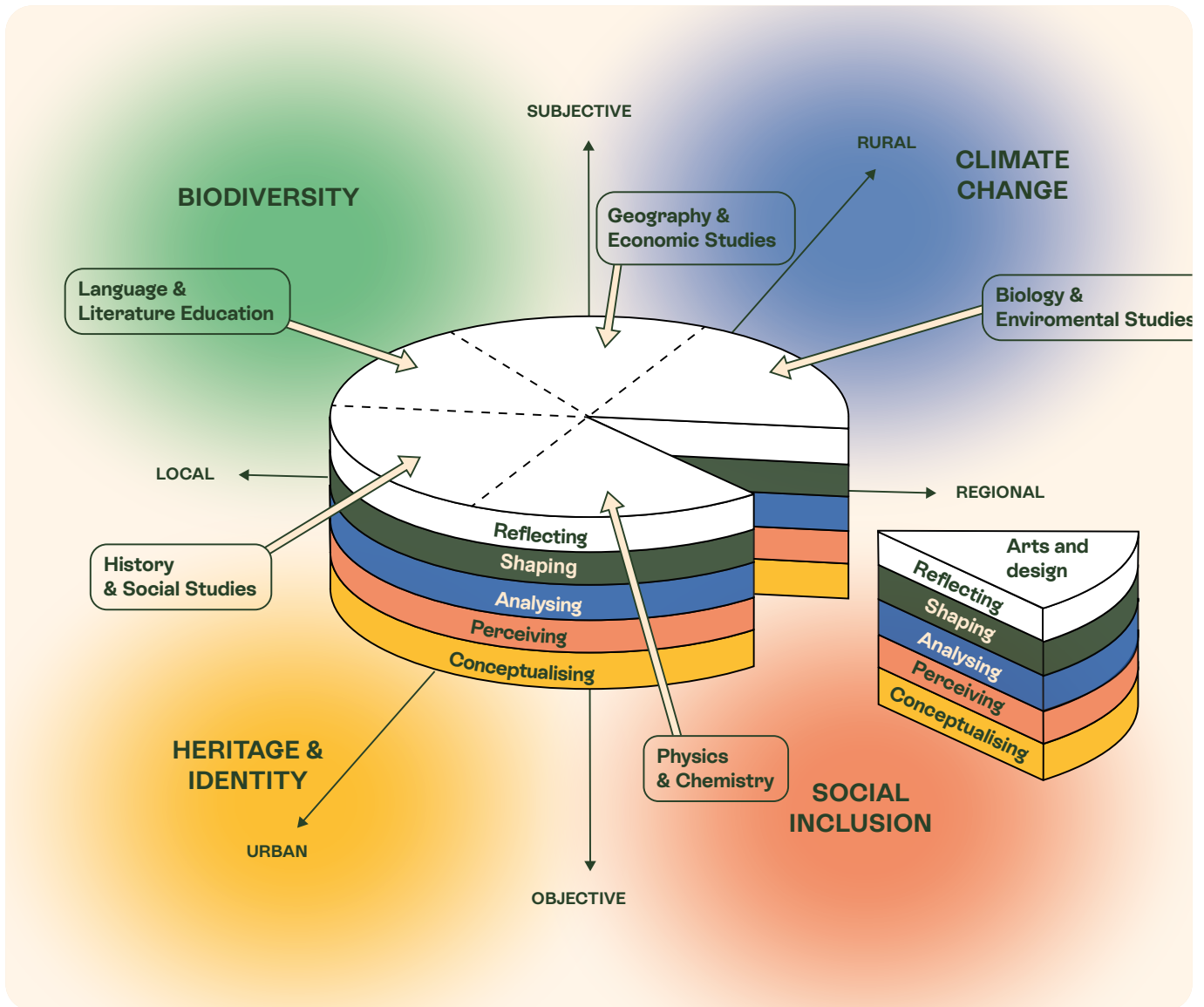
Fig. 16

School-subject-based perspectives on landscape as the arena of societal challenges

5.2 Prepared example units on landscape and climate change

Tab. 3

Overview of Units prepared in the EduScape-project

Within the EduScape-project Units for 15 topic areas have been prepared. Topics cover different aspects of climate change in their relations to landscape(s) as examples of its wider application. Tab. 3 in the annex provides an overview on the units and their contents. The units have been organised into six topic groups of two units each, consisting of a smaller scale (zoom in) and a larger scale (zoom out) perspective:

1. **Construction** *materials, built environment*
2. **Water** *water retention, microclimate*
3. **Agriculture** *productive landscape*
4. **Vegetation** *natural condition, carbon-cycle*
5. **Networks** *transport of people, materials and energy; natural network*
6. **Culture** *beyond the physical landscape*

Introduction	History, culture & heritage	Landscape as a resource	Nature designs	Humans design
01 What is the landscape?	**04** Agriculture transforms the landscape *cultural landscape*	**07** Tracing what we eat	**10** Water is creative force *water retention in river floodplain*	**13** Urban landscape *typology*
02 What does the landscape consist of?	**05** Landscape as chronicle *cultural heritage*	**08** Landscape as source of materials & energy	**11** Plants as partners in the challenge of climate change *microclimate*	**14** Landscape of short distances *barriers & connections*
03 European landscapes In a changing climate	**06** Landscape through my eyes *perception of landscape*	**09** Landscape is a network	**12** Gardens growing wild *succesion*	**15** Into action *tools for design & participation*

After a review of the content of each lesson, the structure was simplified into its final form in order to best suit the target user group and the Eduscape Digital Platform.

Selection of topic areas started with the identification of key challenges relating to climate change and an analysis of how those challenges find their expression in European landscapes. This led to a collection of topic areas that were developed further and consolidated, with regard to the following questions:

A. How and where do those topics connect to existing curricula?
B. How can the topics be structured from a didactic point of view?

While a) was supported by an extensive analysis of school curricula in the project partner countries, b) was aided by school-teachers expertise obtained using questionnaires and during the expert workshops at transnational meetings and multiplier events in the partner countries. Didactics deal with questions as:

- which are the challenges and problems dealt with in the unit?
- what do you have to know to relate to the topic and to deal with the challenges?
- which are the competences students should achieve after working on the unit?

Each topic provides units tailored for primary- and for secondary school classes. The basic design of a unit follows the five stages from "conceptualising" to "reflecting", with a standard package of five lessons to fit into the time-schedule of school-lessons. However, the scope of lessons may vary, depending on the topic. While most of the materials can be used in one single school-subject, the conception of the units follows a design, that could involve more than one (and up to five) different subjects in an interdisciplinary way.

For each Unit a short briefing document provides core information for teachers, consisting of:

- Unit title and sub-title
- Addressed age group
- Duration of the Unit
- Key words
- Links to curricula
- A brief description of the contents
- Goals for students and expected competences
- Didactic approaches
- An overview of the Unit plan, with a list required tools and materials with the applied methods
- References for teachers, regarding further information on the topic

The basic, overarching idea behind all of the units is to utilize the landscapes surrounding the schools as starting points for inquiry-based learning processes. Comparison with the landscapes in other European regions in order to become aware of the broad variety of landscapes (and the differing challenges connected to climate change) but which can be approached in a similar manner, forms another connecting element between the units.

5.3 "Conceptualising landscape (in the light of climate change)" – an introductory lesson for teachers and children

Our current understanding of landscape, as introduced in chapter 2, is based on the definition given by the European Landscape Convention: "Landscape is an area perceived by people...". Although a simple statement, it carries far-reaching consequences regarding the process of perception in itself, and it forces us to reflect on the preconditions of what and how we can perceive, understand and learn. By alluding to the fact, that there is an outside world, composed of physical and material objects, and there is a person/subject with an individual history that perceives in an individual way reminds us of the objective and the subjective sides of building knowledge of the world. But it also reminds us of the fact, that communication of our individual perceptions forms the groundwork for a common understanding of the outside world – and common and collective processes of learning. Before entering the EduScape units, we recommend an introductory lesson on the landscape-concept by itself, to raise awareness for this 'landscape-paradox'. We can follow the stages of didactic involvement as laid out above.

The starting point (*"Conceptualising landscape"*) is work on a common understanding of landscape as a concept. All didactics on and with landscape require a basic understanding of what landscape is (or might be), how we perceive it and why we perceive it in that way. As landscape is part of our everyday language, everybody – child or grownup – has an idea of landscape. But to communicate this idea is not easy, and to find a common definition is even more complex. This becomes obvious, if we ponder questions such as: to whom does the landscape belong, who creates it and who is responsible for it? Reflexion on these questions makes clear, that conceptualising landscape is a philosophical challenge, but with very tangible consequences. Therefore, we suggest positioning that investigation at the very beginning when teaching on and with landscape. It should include engagement with the history of the landscape concept, the history of landscape perception and an approach to the "state of the art" of contemporary landscape conceptualisation, finding its expression in the "European Landscape Convention".

This can be followed by lessons on what we see, hear, smell, taste and feel, if we turn to a landscape (*"Perceiving landscape"*). Active sensory perception and experience, the opening to a subject is a crucial step in learning processes. In perceiving landscapes, we are reminded of the fact, that there are differences between individual perceptions although it may

be the same landscape we are in. We can learn, that landscape is a physical reality, but also a personal environment that is individually perceived and can have specific personal associations. Beyond that, we can find out, that we have learned specific ways of perceiving a landscape (for example, through the construction of perspective that creates relations between vicinity and distance) that make landscape and its perception social constructs. Further, we can learn to distinguish between selective, analytical and holistic approaches to landscape perception.

All these aspects form the foundation for the next level of systematically investigating landscapes and their various elements, components and facets (*"Analysing landscape"*). This would describe the classical, science-based approach. Here, a multitude of research questions – either from natural, social, historical or other scientific perspectives – may be investigated, applying every conceivable methodological framework (and connecting with every school subject and its topics). "Zoom in" and "zoom out" techniques could be tested. Analysis may lead to insights of practical relevance. But experience with analysing also reminds us of the importance of synthesising and the contextualisation of the data and information gained. Teaching formats with project-orientated character might aim to transfer those insights back to practice – particularly if analysis was conducted from a problem-orientated perspective, so that the results could contribute to the solution of a scientific "problem".

Then teaching in and with landscape might shift to another level, where active responsibility for landscape comes into focus (*"Shaping landscape"*). This is the level, where complex teaching designs such as service learning or place-based education enter the picture. On the one hand, within this stage awareness can be raised for the fact that landscapes are environments shaped by people. Interest focuses on the forces and processes behind the shaping of a landscape. It also becomes clear, that humans play a central role in the shaping, for their own purposes. On the other hand, it will become evident, that we all are actors in designing the landscape – sometimes intentionally, frequently unwittingly through our lifestyles and behaviours. Here we leave the level of subject-orientated education (although this can remain a starting point) and achievements as "design competences", participatory practices and political education gain relevance. It will be discovered that the shaping of landscapes is a collective process involving negotiations between all the actors living and acting within it.

Finally, the stage of *"Reflecting and re-localising landscape"* describes the level of dealing with the landscape concept, where it forms a location for comprehensive discourses on questions such as place-making, commonality, identity, social inclusion/exclusion or – biological and/or
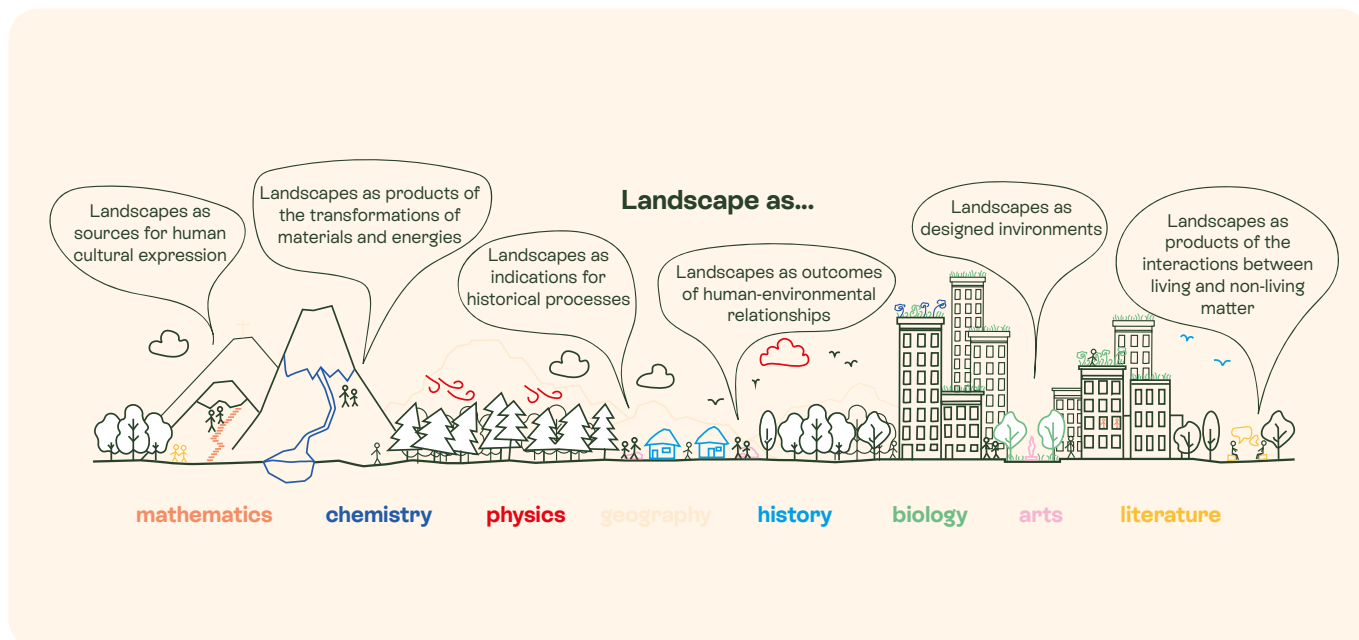
Fig. 17

The local landscape provides the basis for teaching all subject areas

cultural – diversity. For all of these discourses, landscape not only forms an arena, but also provides numerous either positive or problematic, contemporary or historic examples for dealing with them (Fig. 17). Reflection on the statement, that landscape is "an area, perceived by people...", now might enable one to recognise more clearly one's own "way of seeing" the "screened picture" together with the values, ideas and pre-conceptions it incorporates.

Climate change – on the other hand – is a highly complex phenomenon, based on large-scale and long-term chemical-physical processes that seem very abstract to the human perception apparatus. Still, its effects, particularly on landscapes, may be very tangible. This is why we see landscapes as suitable learning environments for climate change education. However, to be able to link the local to the global (and vice versa), one has to grasp the "big picture" in order to understand the variety of local effects. Therefore, introductory lessons on the basic mechanisms of climate and climate change will work as starting points and a basic precondition for all continuing units. A broad body of learning materials on climate change has already been published, for the primary as well as secondary school level, so we can fall back on and refer to that. By using the "zoom-in and zoom-out"-approach in the prepared units, we are able to address local, regional and global aspects of climate change and teachers and students will be enabled to make connections between small- and large-scale phenomena and how they may interact between each other.

References

Faust, M. 2012, Thinking outside the left box: the role of the right hemisphere in novel metaphor comprehension. Advances in the neural substrates of language: Toward a synthesis of basic science and clinical research, 425-448.

Fiore, S. M., & Schooler, J. W. 1998, Right hemisphere contributions to creative problem solving: Converging evidence for divergent thinking. Right hemisphere language comprehension: Perspectives from cognitive neuroscience, 349-371.

Foroohar, R. 2019, Don't Be Evil: The Case Against Big Tech, Allen Lane, London

Gijselaers, W.H. 1996, "Connecting problem-based practices with educational theory". In: Wilkerson, L. & Gijselaers, W.H. (Eds.): Bringing problem-based learning to higher education: Theory and practice, 13-21

Gräsel, C. & Gniewosz, B. 2011, Überblick. In: Reinders, H. et al. Empirische Bildungsforschung. Gegenstandsbereiche. VS Verlag für Sozialwissenschaften, 15-21

Haupt, P. 2012, Landschaftsarchäologie. Theiss, Konrad.

Hein, G. E. 1991, Constructivist learning theory. Institute for Inquiry. Available at:/http://www. exploratorium. edu/ifi/resources/constructivistlearning. htmlS.

Howlett K., Turner E.C. 2023, What can drawings tell us about children's perceptions of nature? PLoS ONE 18(7): e0287370. https://doi.org/10.1371/journal.pone.0287370

Jaynes, J. 2000, The origin of consciousness in the breakdown of the bicameral mind. Houghton Mifflin Harcourt.

Kahlert, J. 2001, Didaktische Netze–ein Modell zur Konstruktion situierter und erfahrungsoffener Lernumgebungen. Konstruktivistische Schulpraxis. Beispiele für den Unterricht, 73-94.

Kandel, E. 2016, Reductionism in art and brain science: Bridging the two cultures. Columbia University Press.

Klafki, W. 1993, Allgemeinbildung heute – Grundzüge internationaler Erziehung. In: Pädagogisches Forum, H. 1, S. 21–28

Klafki, W. 1994, Zweite Studie: Grundzüge eines neuen Allgemeinbildungskonzeptes. Im Zentrum: Epochaltypische Schlüsselprobleme. In: Klafki, Wolfgang: Neue Studien zur Bildungstheorie und Didaktik. Zeitgemäße Allgemeinbildung und kritisch-konstruktive Didaktik. 4. Aufl., Weinheim/Basel

Koch-Priewe, B. 2007, Das Potenzial der Allgemeinen Didaktik: Stellungnahmen aus der Perspektive der Bildungstheorie von Wolfgang Klafki, Beltz.

Kondo, Michelle C., Kehinde O. Oyekanmi, Allison Gibson, Eugenia C. South, Jason Bocarro & J. Aaron Hipp 2020, Nature Prescriptions for Health: A Review of Evidence and Research Opportunities, Int. J. Environ. Res. Public Health, 17, 4213; doi:10.3390/ijerph17124213

Lave, J., & Wenger, E. 1991, Situated learning: Legitimate peripheral participation. Cambridge university press.

Leavell, M. A. J. A. Leiferman, M. Gascon, F. Braddick, J. C. Gonzalez & J. S. Litt 2019, Nature-Based Social Prescribing in Urban Settings to Improve Social Connectedness and Mental Well-being: a Review, Current Environmental Health Reports 6:297–308 https://doi.org/10.1007/s40572-019-00251-7

Lorzing, H. 2001, The Nature of Landscape: A Personal Quest, 010 Publishers, Rotterdam, p. 24-25

McGilchrist, I. 2009, Second Edition 2019, The Master and his Emissary: The Mivided Brain and the Making of the Western World. Yale University Press.

Meinig, D. 1979, The Beholding Eye, in Meinig (Ed.) The Interpretation of Ordinary Landscapes, Oxford University Press, Oxford.

Mitchel, D. 2000, Cultural Geography. A Critical Introduction. Blackwell Publishing

Piaget, J. 1984, Psychologie der Intelligenz. Stuttgart.

Ruppert, W., & Spörhase-Eichmann, U. 2010, Biologie-Didaktik. Praxishandbuch für die Sekundarstufe I und II. Unter Mitarbeit von Wolfgang (Hrsg.) Ruppert, 4.

Schmied-Kowarzik, W. 2019, Kritische Theorie einer emanzipativen Praxis. Beltz.

Steiner, R. 2011, Kompetenzorientierte Lehrer/innenbildung für Bildung für Nachhaltige Entwicklung. Kompetenzmodell, Fallstudien und Empfehlungen. Schriftenreihe Bildung & Nachhaltige Entwicklung. MV-Verlag.

Tauritz, R. L. 2016, A pedagogy for uncertain times. Research and innovation in education for sustainable development, 90-105.

Tian, H., & Liu, X. 2022, Pro-environmental behaviour research: Theoretical progress and future directions. International Journal of Environmental Research and Public Health, 19(11), 6721.

United Nations – Department of Economic and Social Affairs: Sustainable Development Goals, THE 17 GOALS | Sustainable Development (un.org) accessed 27. 07. 2022

Weinert, F. E. 1999, Konzepte der Kompetenz. Paris, OECD.

Weitzel, H. 2015, Welche Bedeutung haben vorunterrichtliche Vorstellungen für das Lernen? In: Spörhase, U. (Ed.): Biologiedidaktik. Praxishandbuch für die Sekundarstufe I und II, 62-81.

Wolf, G. 2005, Konstruktivistische Umweltbildung. Ein postmoderner Entwurf im Kontext der Bildung für nachhaltige Entwicklung. Bertelsmann Verlag.

Zuboff, S. 2019, The Age of Surveillance Capitalism, Profile Books, London

Acknowledgements

EDUSCAPE