

Learning time in Environmental and Sustainability Education.

Promoting time as a resource for sustainability in formal education.

Academic dissertation

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*The thing about working with time, instead of against it,
is that it is not wasted. Even pain counts.*

Ursula K. Le Guin, *The Dispossessed*

Summary

Contemporary society is shaped by the idea that time is, above all, a scarce economic resource that must be used efficiently – “time is money” not to be wasted. Increasingly, however, scientific findings suggest that such a way of perceiving of time seems a major cause of the current global climate and sustainability crisis. So far, this research has often focused on mobility, energy consumption, or the structural conditions of the social organisation of time. Considerably less work has been carried out in relation to the role of individual time-related needs regarding unsustainable consumption behaviour, although consumer research has been addressing needs-oriented approaches to sustainable consumption for a long time.

Environmental and Sustainability Education (ESE) is considered an essential strategy to achieve the global sustainability goals of Agenda 2030. Internationally, as well as on a national level, ESE is increasingly mainstreamed in educational curricula and practice, including in Germany. Given the relation between time, needs and sustainability, it appears valuable to inquire into this field from the perspective of ESE – where time as a resource for sustainability has received comparatively little attention so far. The core research interest of this cumulative dissertation is therefore the question of how the connection between time, our needs and sustainability can be conveyed through pedagogical approaches. The inquiry used an exploratory, qualitative research design to address this question.

In a first step, the concept of sustainability-related time use competence was developed. This then served as a guiding concept for the understanding of time used in this work and as the overall objective for the educational intervention developed and piloted as part of the research. Next, a content analysis of German curricula was conducted with the aim of determining whether and to what extent these address the relation between time and sustainability. The results show curricula contain only a few starting points that encourage a connection between time and sustainability in school lessons. The study further indicates that an understanding of time as a scarce resource to be used efficiently has prevailed in school contexts so far. Accordingly, pedagogical approaches to time often focus heavily on time management.

The next step involved developing and piloting a time use competence curriculum in cooperation with three partner schools, using an Action Research Approach. This intervention followed the pedagogical approach of Self-Inquiry Based Learning (SIBL) seeking to sensitise learners to the relation between individual needs and consumer behaviour. During implementation, which lasted one semester, students logged their time, were encouraged to reflect on their personal needs, and subsequently implement individual change projects related to time use. This was embedded in continuous reflective individual and group exercises.

The results strengthen the hypothesis that there is a relation between time use and sustainability. Furthermore, the pedagogical approach of SIBL has proven suitable to enable students to reflect on their time use and to raise their awareness of the role of individual needs. Participants reported that changes in time use did indeed increase their personal well-being. This, according to existing evidence from sustainability science, has been found to potentially lead to more sustainable behaviour. At the same time, previous research found that behavioural changes that lead to an increase in well-being do not

automatically lead to more sustainable consumption behaviour. Rather, personal attitudes and motivation regarding sustainability are important. This suggests that future ESE interventions aiming at changes in time use should always also contain sufficient opportunities for reflection of values and motives.

A third empirical study was carried out, inquiring into students' time use during the period of COVID-19-induced school closures, using a Grounded Theory Approach. Since the pandemic disrupted young peoples' routines drastically, the research focused on which kinds of learning experiences students made during this time and which insights can be derived for ESE. The results of the semi-structured interviews with 69 participants show first that the narrative of students' learning loss, which is predominant in the current educational science, policy, and media discussion, falls short. Instead, a variety of learning experiences are revealed, such as learning one's own learning and everyday rhythms or creatively adapting consumption habits to the new situation of "lockdown".

Overall, a key finding of this work is that students are currently unable to adequately realise their time-related needs. In view of the findings from research on time and sustainability, one recommendation is therefore that everyday school life could give students more space to organise their time according to their needs. This might be done through pedagogical measures in the classroom, but would also require a stronger institutional anchoring, for example, within the framework of the Whole Institution Approach to Sustainability (WIA), to bring about lasting changes. Furthermore, it would be advisable to give the topic of time in connection with sustainability more space in curricula and in teacher training. This gives rise to future research needs, such as the need to explore how time use competence can be included into everyday pedagogical practice, for instance, by adapting the SIBL approach piloted in a school setting here. It would also call for longitudinal research designs, and it would be of interest to research how time use competence might be incorporated into school development processes.

Given the ongoing debate about the impact of the COVID-19 pandemic on schools and education in general, the findings of the research can stimulate both further research and future ESE practice. The experiences during the pandemic have shown that schools and all actors involved including students and teachers, are so far insufficiently prepared to handle crises. Here, the approach to time use competence piloted in this work can offer valuable stimulations for ESE research and practice. This is especially true since it is compatible with existing approaches to key competencies for sustainability by seeking to complement them with a stronger focus on individual, needs-oriented time shaping.

Zusammenfassung

Unsere Gesellschaft ist geprägt von der Idee, dass Zeit vor allem eine knappe ökonomische Ressource ist, die es effizient zu nutzen gilt – „Zeit ist Geld“ und darf entsprechend nicht verschwendet werden. Inzwischen mehren sich jedoch wissenschaftliche Erkenntnisse, die darauf schließen lassen, dass ein solcher Umgang mit der Zeit eine wesentliche Ursache der gegenwärtigen globalen Klima- und Nachhaltigkeitskrise ist. In der Forschung stehen bislang häufig Fragen nach Mobilität, Energieverbrauch oder struktureller Bedingungen der gesellschaftlichen Zeitorganisation im Fokus. Bislang weniger erforscht ist, welche Rolle individuelle zeitbezogene Bedürfnisse hinsichtlich nicht nachhaltigen Konsumverhaltens spielen, obwohl sich die Konsumforschung seit längerem mit bedürfnisorientierten Zugängen zu nachhaltigem Konsum befasst.

Die Bildung für nachhaltige Entwicklung (BNE) gilt als eine wesentliche Strategie, um die globalen Nachhaltigkeitsziele der Agenda 2030 zu erreichen. International wie auch auf nationaler Ebene wird die BNE immer stärker in Bildungsplänen und –praxis verankert, so auch in Deutschland. Entsprechend bietet sich an, die Verbindung von Zeit, Bedürfnissen und Nachhaltigkeit aus der Perspektive der BNE zu erforschen – wo es bisher vergleichsweise wenig Beachtung findet. Der Ausgangspunkt der vorliegenden kumulativen Dissertation ist daher die Frage danach, wie die Verbindung zwischen Zeit, unseren Bedürfnissen und der Nachhaltigkeitsthematik pädagogisch erfahrbar und nutzbar gemacht werden kann. Die Arbeit nutzte ein exploratives, qualitatives Forschungsdesign um dieser Frage nachzugehen.

Zunächst wurde das Konzept der nachhaltigkeitsbezogenen Zeitgestaltungskompetenz erarbeitet. Es diente im Folgenden als Leitidee für den in dieser Arbeit verwendeten Zeitbegriff sowie als Oberziel für die im Rahmen der Forschung zu entwickelnde pädagogische Intervention. Anschließend erfolgte eine Inhaltsanalyse bundesdeutscher Curricula mit dem Ziel, herauszufinden, ob und inwiefern die Verbindung von Zeit und Nachhaltigkeit in diesen thematisiert werden. Die Ergebnisse zeigen, dass Lehrpläne nur wenige Ansatzpunkte enthalten, die eine Verbindung von Zeit und Nachhaltigkeit im Schulunterricht anregen. Ferner deuten die Ergebnisse darauf hin, dass in schulischen Kontexten bislang eine Vorstellung von Zeit als knapper, effizient zu nutzender Ressource vorherrscht und entsprechend vor allem ein Zugang zu Zeit im Sinne eines Zeitmanagements vermittelt wird.

Darauf aufbauend wurde ein Curriculum zu Zeitgestaltungskompetenz entwickelt und mittels eines Action Research Ansatzes in der Zusammenarbeit mit drei Partnerschulen implementiert und beforscht. Diese Intervention nutzte den Ansatz des Self-Inquiry Based Learning (SIBL), der Lernende für den Zusammenhang zwischen individuellen Bedürfnissen und Konsumverhalten zu sensibilisieren sucht. Im Verlauf der ein Halbjahr dauernden Intervention sollten Schüler*innen zunächst ihre Zeitgestaltung selbst beobachten und auf dieser Grundlage individuelle Veränderungsprojekte entwickeln und durchführen. Dies wurde fortlaufend gemeinsam sowie abschließend individuell reflektiert.

Die Ergebnisse stärken die Hypothese, wonach es einen Zusammenhang zwischen Zeitgestaltung und Nachhaltigkeit gibt. Der pädagogische Ansatz des SIBL hat sich dabei als geeignet gezeigt, um Schüler*innen zu befähigen, ihre Zeitgestaltung zu

reflektieren und dabei ihr Bewusstsein für die Rolle individueller Bedürfnisse zu schärfen. Dies wiederum kann erwiesenermaßen zu nachhaltigerem Verhalten führen. Gleichzeitig ist aus der Forschung auch bekannt, dass Verhaltensänderungen, die zur Steigerung des Wohlbefindens führen, nicht automatisch zu nachhaltigerem Konsumverhalten führt. Vielmehr sind die persönliche Haltung und Motivation hinsichtlich Nachhaltigkeit von Bedeutung. Somit lässt sich für die BNE die Erkenntnis ableiten, dass künftige Interventionen, die auf Veränderungen des Zeitnutzungsverhalten abzielen, stets auch eine solche Reflexion von Werten und Motiven mitberücksichtigen sollten.

In einer weiteren empirischen Studie wurde mittels eines Grounded Theory-Ansatzes die Zeitgestaltung von Schüler*innen während der Zeit der Schulschließungen erforscht. Da die Pandemie die zeit- und die konsumbezogenen Routinen der jungen Menschen in einschneidender Weise unterbrach, stand dabei die Frage im Vordergrund, welche Lernerfahrungen die Schüler*innen dabei machten und welche Erkenntnisse sich daraus für die BNE ableiten lassen. Die Ergebnisse der leitfadengestützten Befragung von insgesamt 69 Personen zeigen zunächst, dass das in der derzeitigen bildungswissenschaftlichen und medialen Diskussion vorherrschende Narrativ des Lernverlustes von Schüler*innen zu kurz greift. Stattdessen zeigen sich eine Vielzahl an Lernerfahrungen, wie etwa das Erlernen eigener Lern- und Alltagsrhythmen oder das kreative Anpassen von Konsumgewohnheiten an die neue Situation des „Lockdowns“.

Insgesamt ist eine wesentliche Erkenntnis dieser Arbeit, dass Schüler*innen ihre zeitbezogenen Bedürfnisse gegenwärtig nur unzureichend realisieren können. Angesichts der Erkenntnisse aus der Forschung zu Zeit und Nachhaltigkeit lautet eine Empfehlung daher, dass der schulische Alltag den Schülern mehr Raum zur bedürfnisorientierten Zeitgestaltung geben sollte, da dies wiederum das Potenzial hat, zur Erreichung der Ziele der BNE beizutragen. Dies kann durch pädagogische Maßnahmen im Unterricht geschehen, bedürfte jedoch auch einer stärkeren institutionellen Verankerung, etwa im Rahmen des Whole Institution Approaches for Sustainability (WIA), um dauerhafte Veränderungen zu bewirken. Ferner wäre es empfehlenswert dem Thema Zeit in Verbindung mit Nachhaltigkeit mehr Raum in Curricula sowie auch in der Lehrkräftebildung zu geben. Hieraus ergeben sich künftige Forschungsbedarfe, etwa die Notwendigkeit, zu erforschen, wie Zeitgestaltungscompetenz im pädagogischen Alltag umgesetzt werden kann, indem der hier vorgeschlagene Ansatz des SIBL weiter angepasst oder auch in längsschnittlichen Designs umgesetzt wird. Ferner wäre von Interesse, wie Zeitgestaltungscompetenz in die Schulentwicklung auf allen Ebenen eingebracht werden kann.

Angesichts der anhaltenden Debatte um die Auswirkungen der COVID-19-Pandemie auf Schule und Bildung können die Ergebnisse der Forschung sowohl weitere Forschung als auch die künftige Praxis der BNE anregen. Die Erfahrungen während der Pandemie haben gezeigt, dass Schule und ihre Akteur*innen bislang unzureichend auf das Bewältigen von Krisen vorbereitet sind. Hier kann der in dieser Arbeit pilotierte Zugang zu Zeitgestaltungscompetenz Anregungen für BNE-Forschung und Praxis bieten. Insbesondere auch, da er sich anschlussfähig zeigt an bestehende Ansätze zu Schlüsselkompetenzen für Nachhaltigkeit, indem er diese um einen stärkeren Fokus auf individuelle, bedürfnisorientierte Zeitgestaltung zu ergänzen sucht.

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How many times did I think about to just leave it be? I have not counted, but there were periods when I thought about quitting this project every day. Yet, I kept on. Because part of what kept me going was this thought: What kind of role model am I for my kids? And while I find it equally important to teach your kids that it is alright to quit because you mustn't always keep on for the sake of keeping on, I always felt that eventually, I would be alright. That it would be worth the struggle in the end. So, this is for you, Erik and Martha, as much as it is for me. I hope you will pull through in your lives with whatever is making you happy, and that you will be able to use your time in a way you are going to deem worthwhile in the end.

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Abbreviations

BMBF	Bundesministerium für Bildung und Forschung (German Federal Ministry for Education and Research)
ESC	Education for Sustainable Consumption
ESD	Education for Sustainable Development
ESE	Environmental and Sustainability Education
OECD	Organization for Economic Co-operation and Development
ReZeitKon	German Acronym for Time rebound, time wealth and sustainable consumption (Zeit-Rebound, Zeitwohlstand und nachhaltiger Konsum)
SIBL	Self-inquiry based learning
SÖF	Sozial-Ökologische Forschung (Social-ecological research programme)
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNESCO	United Nations Education, Scientific, and Cultural Organization
UNICEF	United Nations Children's Fund
WIA	Whole Institution Approach to Sustainability

Preface: A personal introduction

Before I began working on this dissertation, I never consciously thought about time that much. Or so I thought. In retrospect, though, I realised this was not true. I had, in fact, been thinking constantly about time, but without consciously reflecting on it. Only when I began my academic research on aspects relating to time, individual needs, and sustainability-related consequences, I investigated my own life and my relation to time more systematically. It was then that I realised a few key revelations which I had about time in my life until then. In the following, I would like to recap three. At the time, each felt both puzzling and enlightening, but I forgot about them gradually. Only when I began thinking about time as relating the self to the social and natural surroundings during my dissertation research, I remembered how intense each of them felt. To frame my subsequent academic writing about time, personal needs and sustainability, I want to share these because the engagement with time and sustainability involves this kind of clarification and becoming aware of one's personal "time history".

I.

I grew up on a farm. Here, life is paced by the turn of the seasons. Each year is a renewed cycle of sowing, tending, harvesting and then the winter rest, only to begin anew with another spring. Yet while the turn of the seasons was the same, each year and each season would differ from the preceding ones, and from those that were to follow. One year, spring might be too dry, harming plants while growing, resulting in fields yielding fewer crop. Sometimes the summer was perfect and the harvest abundant. But then, autumn might bring too much rain, turning the soil into mud, delaying work in the fields. Or winter would be too warm, so we'd have more bugs in the following spring.

I never consciously thought about the four-season cycle and how it shaped and influenced my life and my experience of time; it was simply a given. Until I spent a year as a development worker in the Southern Highlands of Tanzania, in my mid-twenties. Only then, I discovered that my body was attuned to a specific pattern of natural cycle, making me feel somewhat out of place while living in Southern Tanzania. Here, just south of the Equator, the seasons are reversed compared to Western Europe. In June, it is autumn, and nights can already get quite cold in the Highlands, while days are still warm.

It was on a sunny autumn day somewhere on the red dirt road between the villages of Makongolosi and Saza that I noticed that all the trees had lost their leaves, but that it somehow felt different from the autumn I was familiar with. The temperature was different, and so was the light. There, on that dusty gravel road, it struck me that all these pieces added up to a mosaic, which made me realise missing the familiar cycle of spring, summer, autumn, and winter. My body, I felt, was used to the cycle of the four seasons, and it felt different to live within a different seasonal cycle. I cannot describe it very well, I am afraid, but I felt a kind of bodily longing for a familiar rhythm, which was absent for the time being.

The way I experience time has a relation to our natural environment, and it is something we embody while growing up, I realised.

II.

Two years before, also in Tanzania, I had had another encounter with time. I was in a small town in the North of the country where I had been the year before as a volunteer, and where I had returned to do three months of ethnographic fieldwork with a local women's organisation focusing on HIV/AIDS prevention and care. It was in the course of my time there that I realised that time always has a specific socio-cultural meaning. As a soon-to-be graduating social anthropologist, this should not have surprised me the way it did. Yet it was only through interacting with the local people that I began to reflect on my own values and beliefs about time stemming from having grown up within the ever-busy life of first within a rural German middle-class family and then spending a few years in a not-so-small university town.

As part of their activities, the organisation's staff would go for outreach visits in nearby villages, to give educational talks, sometimes accompanied by a theatre group who played educational skits or music, all meant to raise awareness of HIV/AIDS prevention and care. No matter when and where this happened, a lot of people of all ages would show up, at any time of the day. And I kept asking myself: Didn't they have somewhere else to be? Work? Other duties? Back home, I thought, events such as these could never happen at 12 noon. No one would show up.

But after a few weeks observing and talking to people, I realised this was, for once, a result of poverty and lack of employment opportunities in the formal sector. But it was also very much a result of a difference in socio-cultural concepts of time. Time spent with their community mattered to people. When there was a gathering, those who could manage would come by, because spending time with others was valued as a pastime. Even the tailor who might leave her sewing machine for half an hour, or the farmer who perhaps was already done with his work for the day.

Time is an element of social relations. Notions like 'time is money', and 'wasting time', are specific products of a Western upbringing, I realised.

III.

A third occasion sparking my reflection about time happened during the weeks and months after I had my first child, now over eight years ago. Back then, the experience of essentially having lost control over my time because of having to prioritise the baby's needs came as a shock to me. And ever since a second child entered my life, five years ago, time has yet become more precious, because time is essentially about balancing my individual needs with those of my family, not to speak of other duties, and volunteer and job-related tasks.

How often do I keep telling my children "I don't have time for this" or "Please hurry up, we will be late." While I often felt uncomfortable doing so, it was the work on this dissertation that sensitised me to the extent to which we pass on to our children our internalised notions of efficiency regarding time – and how the problem is not a 'lack of time', but existing societal constraints. These include too rigid working and care hours or outdated ideas about the value of paid time versus unpaid time, such as care duties. We could change all this by, for example, putting more emphasis on individuals being able to both recognise and, at least in part, realise their time-related needs.

We all have individual time-related needs, but our upbringing, including our education, all governed by the clock, fails to sensitise us to these individual needs and the importance of their fulfilment, I realised.

During all the time while working on my dissertation, I kept thinking about how complex the web of time is in which we are entangled. How we all have our individual 'time-biography' which relates to how we experience and use time. Thus, I became aware that individual use of time is always a specific result of certain circumstances, which sometimes cannot be changed, and that it must always be conceived in a wider social context. Looking back, I realise how my occasional reflection on time and my previous engagement with sustainability and sustainability education have evolved from a partly unconscious preoccupation to a matter of the heart that I consciously pursue, and which has become a core topic of interest to me. In particular, I am trying to be careful with my time, and to take my time and do what caters to my individual needs. Which, I know, I can do because I am in a privileged position. Listening to or playing music, for instance, has been a fantastic pastime for recreating during the writing of this thesis. But not everyone has the chance to seek their time-outs during busy days.

So in the end, working on this final part of the process, the framework paper, allowed me to bring together not only my academic research but also my personal insights mentioned above, which help to frame and contextualise my academic research.

I hope that my work can contribute a small piece of the mosaic to raising awareness of the relation between societal norms and practices on time and their relation to sustainability.

1 Introduction

The map is not the territory. The clock is not the time.

Dr Time (2022)

Time is an essential dimension of sustainability, which is reflected in how the concept of sustainability alludes to a future that is still being created. However, researchers, international organisations and activists alike warn that time is running out considering the rapid unfolding of the present global climate and sustainability crisis (Extinction Rebellion, o. J.; United Nations (UN), 2022; van der Leeuw et al., 2012). And it seems indeed that time is of essence here, yet not just because it is running out. Time, or rather the way modern Western society¹ conceives of time, is increasingly being understood as a driver of unsustainability. Here, time is money, a phrase reportedly coined by Benjamin Franklin (Suzman, 2020). It is considered a scarce economic resource to be used efficiently and not to be wasted. During the past three decades, sustainability researchers have developed an increasing interest in understanding the relation between this approach to time and sustainability. They have studied how the fast pace of contemporary society contributes to a constant rise in carbon emissions through mobility and IT infrastructures (Rau & Edmondson, 2013; Reisch, 2001). There is also evidence for the relation between expectations about tempo and efficient use of time as the source of widespread feelings of time scarcity (Kaufman-Scarborough & Lindquist, 2003). Next to detrimental impacts on the environment this has been found to negatively impact individual health and well-being (Geiger et al., 2021). Time and the use of it are thus of relevance regarding the debate about the need for a social-ecological sustainability transformation (Rinderspacher, 2019; Selby & Kagawa, 2015).

One key strategy considered important for this transformation is Environmental and Sustainability Education (ESE) which is increasingly mainstreamed into national education systems (Olsson et al., 2022; United Nations Educational Scientific and Cultural Organization (UNESCO), 2021). Given the evidence that the current use of time seems to be a relevant factor in the context of the global climate and resource crisis, it is relevant that the ESE seeks ways to addressing this. So far, however, time as a dimension of sustainability has not been a major focus in ESE research and practice. Where time is discussed, taught, and learned in ESE, this is most often happening with

¹ I use the terms “modern” and “Western” in relation to contemporary society as analytical categories, despite their generalising nature. First, I use the term “modern” following the definition of modernity as “a condition of social existence radically different from all previous forms of human existence” (Shilliam, 2017, S. 1). My use of the concept does not imply an understanding according to which there is a hierarchical, implicit relationship between “modern” and “primitive” subjects or societies (ibid.), which has long characterised the understanding of this concept within the social sciences (Marcus and Fischer 1999) and which is associated with European colonial expansion (Clifford, 1983; Said, 1978).

Second, I use the term “Western” analogously to “the Global North” (Braff & Nelson, 2022). Both terms do not refer to distinct geographical regions, but rather include those countries which hold the most power and wealth in comparison to non-Western countries, or countries from the Global South. My use of the term acknowledges in particular that Western countries are the main drivers of climate change and the global climate and environmental crisis, while being the least affected by it, resulting from centuries of colonial exploitation and oppression (Hickel, 2021).

a focus on the future as an open, shape-able potential for the vision of sustainability (Holfelder, 2019). What is of equal importance is to understand how we use our time in the present, how this is related to our individual needs, and the potential consequences it has regarding sustainability (Druckman & Gatersleben, 2019).

Schools are an important setting for implementing ESE. Schools are also sites where time is organised in particular ways, through timetables, and a yearly calendar, for instance. What's more, they are physical spaces where everyone involved, students, teachers, other staff are spending a considerable amount of their time. Schools, therefore, seem interesting sites for inquiring into how time is learned, how this might relate to matters of sustainability, and how ESE might address the previously addressed relation between time and sustainability. This dissertation therefore focuses on the question of how the hitherto under-researched topic of time as a dimension of sustainability might become accessible to ESE research and practice. The empirical research was guided by the following research question: *How can ESE address the relation between time and sustainability in formal education and thus enable learners to use time more sustainably?*

By this, I sought to connect recent evidence on time use and sustainability with research on individual needs satisfaction and sustainable consumption as a framework for developing a pedagogical approach to fostering time as a dimension of sustainability ESE and its sub-field of Education for Sustainable Consumption (ESC).

The research for this dissertation was carried out as part of the transdisciplinary research project *ReZeitKon* (German acronym for *Time Rebound, Time Wealth and Sustainable Consumption*), funded by the German Ministry of Education and Research (BMBF) in its social-ecological research programme (SÖF) (Bundesministerium für Bildung und Forschung (BMBF), o. J.; Griesshammer et al., 2012)). *ReZeitKon* was jointly implemented by Technical University Berlin, Leuphana University Lüneburg and the Fraunhofer Institute for System and Innovation Research (ISI), Karlsruhe, between 2018 and 2021. It had two main goals: First, collecting empirical evidence on the interrelation between individuals' time use and sustainability-related consequences, and second, developing and evaluating measures for increasing individuals' time wealth and reducing the impact of time-bound rebound effects.² The sub-project at Leuphana University from which my dissertation evolved aimed at inquiring into time use competence in school education.

This cumulative dissertation comprises four papers and this framework paper. Paper 1 defines the basic concept of time use competence, which guided the further empirical research. Papers 2 - 4 present the results of three empirical studies. These were: (1) a curriculum analysis of German curricula focusing on whether and in how far these include references to time and sustainability; (2) a study implementing a school-based intervention aiming at fostering students' time use competence through the pedagogical approach of self-inquiry based learning (SIBL) with an Action Research approach; and (3) an inquiry into German students' experiences related to time and sustainable consumption during school closures at the onset of the COVID-19 pandemic, using a Grounded Theory approach. This framework paper aims to embed the single studies into

² For more information about *ReZeitKon* see the project website: <https://www.rezeitkon.de/wordpress/en/about-the-project/>

a comprehensive theoretical background. It also seeks to synthesise the findings in their entirety and to offer an in-depth reflection of various aspects of the research process.

In the following Chapter 2, I will provide the theoretical background for my research. This includes an overview of the study of time and its significance for sustainability, and a section on time and education. This is followed by an overview of ESE as the discipline where the research is located, and which has informed the theoretical and methodological design of this thesis. Also, the sub-field of ESC is introduced, followed by a discussion of the current discourse on key competencies for sustainability and a final section on recent research on individual needs and intrapersonal competencies.

Chapter 3 proceeds with presenting the research framework comprising the research questions and the outline of the methodological approach. Chapter 4 contains summaries of the four papers related to this cumulative dissertation, each of which is included in full in the appendix (see section 10). This is followed by a synthesising discussion in Chapter 5, which also contains a section on the implications of my research for ESE practice. Next, Chapter 6 contains a critical reflection on my research, including the research perspective, the methodology and my positionality. It also gives an outlook regarding future research before presenting some general limitations affecting the research. The final Chapter 7 offers some concluding thoughts. Mirroring the personal introduction in the preface, this framework paper concludes with a personal final reflection in Chapter 8.

A note on terminology

Before I proceed, I would like to explain my understanding of two terms that are central to this work:

Sustainability

Although sustainability is now a widely used concept, it is far from clearly defined (Johnston et al., 2007). While I have no intention of adding another definition, I believe it is vital to clarify how I define sustainability for myself and thus the purpose of my research.

First, I prefer the term *sustainability* over *sustainable development*, as the latter implies an inherent affirmation of the ideas of economic growth (Hopwood et al., 2005), which I view critically. Second, while I share the general vision of sustainability, it is important to keep in mind that sustainability is a Western concept that has developed in a specific socio-cultural context (Petersen-Boring, 2010), even if it aims to offer a universal vision for the global future. Mainstream definitions of sustainability are therefore often anthropocentric, focusing on protecting the environment as a resource for sustaining human life, based on the idea that there is a separation between nature and culture (Mazzocchi, 2020).

In contrast, my understanding of sustainability includes the vision of granting all parts of animate and inanimate nature their right to exist (Winter, 2020)³. This includes recognising that the countries of the Global North are primarily responsible for the current entanglement of social and environmental crises which are tied to the history of European violent colonial expansion (Hickel, 2021; Selby & Kagawa, 2018). By this, I do not mean to romanticise supposedly more sustainable, indigenous lifestyles of non-Western societies in present and former times. Rather, I want to express my conviction that the responsibility for the current crises lies primarily with those who still hold most power in today's world and thus also might be the most powerful actors for changing what is unsustainable. That said, the following quote by Wendy Petersen-Boring very much sums up my idea of sustainability:

“Sustainability, in all of its guises, I have come to appreciate, is a discourse of the “ought”. It is like feminism in that respect. It is informed by a sense of what is not right with the world, and it is shaped by hope for a better way.” (2010, S. 290).

Environmental and Sustainability Education

I chose the term Environmental and Sustainability Education (ESE) over the more widely used term Education for Sustainable Development (ESD). The reason being that next to being critical of the growth paradigm inherent to the term *sustainable development* (Sutoris, 2019), ESE responds to ongoing controversies about the relationship between environmental education and sustainability-related education, thus rendering it as an inclusive concept, embracing the interrelated nature of environmental, societal, political, and economic concerns (Mandikonza & Lotz-Sisitka, 2016).

³ Winter (2020) points out that referring to an animate/inanimate divide, too, is an inherently Western idea and unknown in non-Western societies such as the Māori, for instance.

Time

In the following chapter 2, I am going to discuss time in detail. Before doing so, I want to clarify my distinction between three particular expressions throughout this framework. When I use ...

time as a resource for sustainability, I refer to the idea that everything we do in our time has an impact on sustainability. This approach is considered as an alternative to the prevailing notion of time as a scarce economic resource to be used efficiently. It stems from the research on time and sustainability, including work on time wealth as an alternative to wealth in goods (see section 2.1.2)

time as a dimension of sustainability, I mean that time and its use is a relevant element that needs to be considered in terms of sustainability, similar to consumer behaviour, mobility behaviour, etc. This refers to the way we use time, how time is socially organised, and it also refers to socio-cultural norms regarding time (see 2.1.2).

time as a concept, I am referring to the fact that when we speak of time, we always refer to certain mental representations and not to an objectively existing time. Time has many facets and representations, but how we perceive it has to do with how our socio-culturally shaped ideas have shaped our individual concept of time (see 2.1.1).

2 Theoretical background: Developing a pedagogical approach to learning time in ESE

"What then, is time? If no one asks me, I know; if I wish to explain to him who asks, I know not."

St. Augustine, Book IX of the Confessions (as cited in Birth, 2017, S. 217)

In this chapter, I provide an overview of the theoretical background relevant to my research on time and sustainability. First, I will address how time can be defined and understood. Next, I will discuss the role of time in sustainability research and in formal education⁴. This is followed by an introduction of the field of ESE by briefly summarising three current debates that my research is linked to and a section on ESC as a relevant sub-field of ESE. I proceed with discussing the debate on key competences for sustainability, the role of the approach of transformative learning in ESE and recent research on the needs-based approach to sustainable consumption, all of which contribute to the theoretical foundation of this research.

2.1 Stating the problem: Time as an under-explored topic in ESE

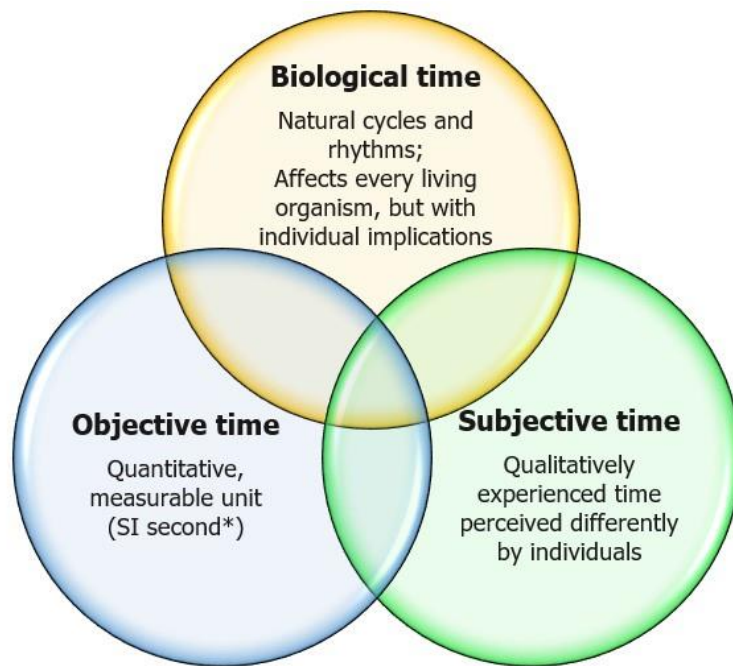
2.1.1 On time: objective, subjective and biological time

The quote by St. Augustine, which opens this chapter, raises an eternal question: What is time and how can we define it? It is "extraordinarily difficult to think and talk about time" (Adam, 1995, S. 5), as Barbara Adam, a leading researcher on the sociology of time, remarks. Time has been a core theme explored within European intellectual and cultural history. Likewise, the study of time as a phenomenon related to human lives has been a topic of interest in various scientific disciplines, ranging from philosophy across physics to sociology (Detel, 2021; Hawking, 2018; Nowotny, 1992). Time is "the most widely used noun in the English language" (Adam, 1995, S. 19; Oxford Dictionaries, 2011), illustrating the significance which contemporary societies attribute to time. Adam goes on:

"Time is multifaceted: It is involved in physical processes and social conventions, in the abstract relations of mathematics and concrete relationships between people. We measure it in clock-time units and by celestial motion, with the aid of recurrent events and through changes in our bodies" (ibid. 1995, S. 20).

Here, Adam distinguishes three characteristics of time, which are: time as a neutral unit of the natural sciences and mathematics (referring to "physical processes" and "abstract relations of mathematics"), time as a subjectively experienced element of social relations (related to "social conventions" and "recurrent events"), and time as a marker of biological processes ("celestial motion" and "changes in our bodies"). In this section, I use this general distinction to establish a conceptual view of time, which I will later relate to the study of time in the context of sustainability.

⁴ In this thesis, I follow the UNESCO's definition of formal education which is defined as "institutionalized, intentional and planned through public organizations and recognized private bodies and, in their totality, make up the formal education system of a country" (UNESCO Institute for Statistics, 2012, S. 80).



*SI second: Standardised unit in the International System of Units (SI)

Figure 1: Three characteristics of time

The distinction between objective and subjective time goes back to Aristotle’s theory of time (Detel, 2021). Subjective time in this sense refers to the now, while objective time describes time as a means of quantitative measurement. This dichotomy between subjective and objective time has become a dominant approach in contemporary discourses on time (Adam, 1995; Colley, 2007; Šubrt, 2021). One reason is that the study of time has been divided between two disciplinary contexts: the natural sciences, focusing on time as a neutral, physical-mathematical phenomenon, and philosophy, which focuses on time as an existential condition of human life. Accordingly, Longo (2021) distinguishes between the natural science perspective of an objective “time of physicists” (p. 375) and the opposite concept of subjective “time of the philosophers” (ibid.). Like Adam (1995), Longo (2021) considers the “time of phylogeny and ontogeny” (ibid., p 375) a third important perspective on time. I thus proceed with outlining each of these three characteristics.

Objective time

For centuries, the “Newtonian approach” (Šubrt, 2021, S. 9) was the predominant concept of time in the natural sciences. Accordingly, time was considered as something absolute and neutral, existing independently of space and always remains the same. This view changed at the beginning of the 20th century with Einstein’s theory of relativity. Subsequently, an increasingly differentiating understanding of time developed in physics research. Time is now considered something that exists relative to motion and space (Hawking, 2018), for example, the concept of directed time in research on thermodynamics (Rovelli, 2018, 2021). Besides physics, with its understanding of time as an element in the context of events, other natural sciences, too, are studying time. For example, biology, where time is considered an irreversible element of evolutionary processes (Longo & Montévil, 2014), neuroscience, which focuses on biochemical

processes of time perception (Fontes et al., 2016), or environmental chemistry where time is relevant in relation to processes of environmental degradation and recovery (Fath, 2019).

Conceiving of time as an objective unit of measurement is a dominant concept of time in Western societies. Here, time is equated with “clock time” (Adam, 2006; Birth, 2017) that is measured with the standardised base unit of the SI second (Bureau International des Poids et Mesures, 2022). Although the SI second appears to be related to the 24-hour solar day, it is in fact calculated independently of the Earth’s rotation cycle (Birth, 2017). Despite being a human invention, clock time is widely regarded as an objectively accurate depiction of the passing of time and a “key influence on social life in industrial societies” (Adam, 1995, p. 24). Similarly, the system of global time zones which became a global standard with European colonial expansion (Hom, 2010; Šubrt, 2021) also obscures the fact that clocks, timetables, calendars, and so on, which govern large parts of our lives, are human inventions rather than a natural given. Despite the increasingly differentiated concept of time in the natural sciences, the idea of the existence of an absolute time, which exists neutrally and uniformly outside the animate world, continues to persist. However, notes physicist Carlo Rovelli (2021): “The time of the clock (...) is not the time of our experience.”(ibid., p. V). Likewise, there is a second, qualitative approach to time, which is tied to our individual subjective experience of our social environment.

Subjective time

Although all individuals dispose of the same 24-hour day, the experience of the passing and pacing of time differs between individuals. While some appear to have an “affluence in time” (Kasser & Sheldon, 2009), others seem to be constantly “pressed for time” (Wajcman, 2015). In the course of the 20th century, this subjective, qualitative experience of time has received increasing interest in the social sciences (Bergmann, 1992; Nowotny, 1992), following Durkheim’s work on time as a means by which social relations are structured (Durkheim, 1969; Sorokin & Merton, 1937; Watts Miller, 2000). Next to a considerable body of research in the sociology of time (Nowotny, 1992; Šubrt, 2021; Wajcman, 2008), time is studied as an economic resource (Jalas, 2002; Schor, 2011). There is also a focus on time as a significant factor influencing individuals’ experiencing stress and satisfaction (Ogden, 2020; Wittmann, 2016), and, more recently, research focusing on the relation between time and sustainability (Adam, 2013; Bornemann & Strassheim, 2019; Handoh & Hidaka, 2010).

The social scientific study of time focuses on how time functions as an element to organise social structures through norms and practices and how this influences subjective perceptions of time. It has shown how the perception of time as objective clock time in Western societies obscures the fact that contemporary norms and practices related to time are human inventions rather than naturally given. Attempts at regulating individuals’ daily lives through rhythms and timetables have been traced back to medieval monasteries attempting to regulate monks’ lives to prevent them from idleness (Adam, 1995; Birth, 2017). Educational researchers, for example, have highlighted the complexity of time in the classroom. This includes studies of how teachers and students negotiate common timing (Breidenstein & Rademacher, 2013; Teixeira de Pinho & Clementino de Souza, 2015), how teachers manage waiting times in class (Wackermann

et al., 2018), or the experience of time pressure faced by teachers and students alike resulting from externally defined learning goals (Duncheon & Tierney, 2013; Gravesen & Ringskou, 2017; Thompson & Cook, 2017).

In addition, research in history and anthropology has further contributed to deconstruct how time served as a means to colonise indigenous peoples by introducing the western clock time approach as the global norm (Bowker, 2014; Fabian, 1981; Huebener et al., 2016). Even though individuals experience time differently, contemporary norms on time are still influenced by the idea of time as an objectively existing unit, measurable by the clock. One reason being that clock time mirrors biological cycles, thus obscuring its origin as a human invention.

Biological time

The third characteristic of time – biological time – refers to biological rhythms and cycles which living beings experience both externally and internally (Longo & Montévil, 2014). The former includes phenomena such as the change of the seasons, experienced through external temperatures, or the availability of seasonal foods, while the latter refers to internal processes happening within individual organisms such as endocrine activities (Longo, 2021) or circadian rhythms (Wittmann, 2016). Biological time, while at times confounded with objective time through the presumed association of clock time with the solar year referred to above, does indeed tangibly influence subjective time perception and thus individually perceived needs.

Recent findings from chronobiology raise attention to how the social organisation of time in contemporary societies often prevents individuals from realising their time-related needs, thus negatively affecting individual well-being. One example is the finding that many young people's circadian rhythms do not coincide with comparatively early school start times, which is thought to have negative effects on their well-being and academic performance (Biller et al., 2022; van der Vinne et al., 2015). Another is the “social jetlag” (Wittmann et al., 2006) which I will discuss in section 2.1.2. In addition, the debate on the Anthropocene⁵ (Zalasiewicz et al., 2010), originating in geology, might be mentioned here. This is of relevance since the Anthropocene is considered an epoch where “space and time have been rearranged” (Kouppanou, 2020, S. 944) through humans interference with natural rhythms and cycles such as the carbon cycle (Lampert & Niebert, 2019; Niebert & Gropengiesser, 2013), including a decoupling of natural and social rhythms. Despite the importance of this debate for the understanding of time in sustainability, I will not go into more detail below, as the focus of this paper is on the relationship between time and individual time-related needs.

In summary, the three characteristics of time – objective time, subjective time, and biological time – may be of help in understanding the various intertwined approaches to time in contemporary society. The idea of objective time has become the dominant

⁵ The Anthropocene is a concept widely used to delineate a geological epoch describing humans impact on ecosystems and geology resulting in significant changes including climate change (United Nations Development Programme (UNDP), 2020; Zalasiewicz et al., 2010). Unlike other geological epochs, the discussion around the Anthropocene engages a variety of disciplines because of its relation between geology and human history and because it includes a moral dimension, too, focusing on issues of power and responsibility for the looming environmental crisis (Chakrabarty, 2018).

concept of time and has accordingly shaped various norms and the institutional regulation of time. However, this supposed objectivity often obscures that time also has a subjective quality, leading to different needs and constraints in relation to time. As a result, the social organisation of time often conflicts with the needs imposed by biological time, causing both health problems and negative effects on the environment. This is in part due to technological progress contributing to the decline of and awareness for natural rhythms. Because of electricity, for instance, we are independent of the daylight and can thus disregard day-night cycles. Many people are no longer aware of seasonal foods because they are available at all the time. In addition, climate change is causing new challenges, for instance, when people have to adapt to changing agricultural cultivation cycles, or when rhythms between plants and pollinators no longer match (Longo, 2021). Modern life can thus be described as unsynchronised. This is where research on time and sustainability connects.

2.1.2 Life out of sync: Time as a dimension of sustainability

During the past two decades, there has been a steady increase in research on how the modern perception of time is related to the global climate and sustainability crisis (Klaver & Lambrechts, 2021; Reisch, 2001; Rinderspacher, 1988; Schor, 2005; van der Leeuw et al., 2012; Weiser et al., 2017). In this section, I will present findings from the social and sustainability sciences, as my research interest in individual time use as a topic for ESE is derived from these. First, I will discuss acceleration and the related phenomenon of time scarcity. Next, I will address the related issues of synchronising individual time with societal and natural time demands, as these have been identified as a major cause of unsustainable consumption. Finally, I briefly present which approaches to solving the problems described have been proposed so far.

The idea of time as a scarce economic resource to be used efficiently at all times is considered one of the drivers of unsustainability in various strands of research focusing on time and sustainability (Adam, 2013; Reisch, 2001; Rinderspacher, 2015). One of the most influential theoretical approaches to modern society's relation to time is Hartmut Rosa's work on the "acceleration society" (2011, 2017). Rosa defines acceleration as caused by an interplay of three phenomena: (1) technological progress which results in improvements in computer technology or transportation, for instance; (2) social acceleration, characterised by increasing rates of turnover, e.g. related to job changes, artistic or fashion styles, etc.; and (3) the "heightening of the pace of life" (Rosa, 2011, S. 64) referring to an increase of actions per unit of time (ibid.). Thus, according to Rosa, technological progress is met by social norms that value the ever-increasing pace of life, fuelling fuels an ever-increasing process of resource consumption and resulting in widespread feelings of time scarcity.

The phenomenon of time scarcity is gaining interest in sustainability-oriented research because of a growing awareness about the importance of the relation between individuals' time use and consumption behaviour. Research on time scarcity identifies several reasons for individuals' experience of this phenomenon. One is the work-spend cycle, which Juliet Schor (2005, 2011) considers a main characteristic of contemporary

consumer society⁶. According to Schor, the constant need to consume is causing individuals to work as many hours as possible to afford their consumption. This, she argues, results in individuals' constant feeling of time scarcity.

Southerton (2020) considers the general social organisation of time in contemporary societies causal of the widespread feeling of time scarcity. He argues that everyday life requires individuals to navigate an increasingly complex system of different layers of time, resulting in a constant feeling of "harriedness" (Southerton, 2003, S. 6). Families, for example, often have to organise their eating, reproductive and leisure activities in such a way that individual needs are given space alongside work and school hours, shop-opening hours and other appointments. This requires constant efforts from individuals to synchronise and coordinate their own time with the time of others, both individuals and institutions. This, together with a frequently experienced lack of autonomy over one's own time, argues educational scientist Michael Alhadeff Jones, often results in people feeling disempowered due to "temporal alienation" (2020, S. 118). These experiences lead to permanent feelings of stress and thus have a negative impact on the well-being of the individual. Indeed, recent evidence shows that, for both adults and adolescents, lack of time is one of the main factors negatively affecting their individual well-being (Burke et al., 2017; Gerold & Geiger, 2020; Strazdins et al., 2011; Thing et al., 2015). Besides the perceived inability to realise individual time-related needs because of an accelerated pace of life (Schöneck, 2018), a lack of free time or discretionary space is considered a main factor (Chai et al., 2015; Hansen, 2015).

The experience of time scarcity and the associated negative impacts on individual well-being are considered among the reasons for unsustainable consumption decisions (Jalas, 2004). Another example is mobility, where time norms valuing speed and efficiency have been found to result in negative effects on the environment. For instance, while the time spent on mobility has hardly changed over the past century, expectations about the kinds of distances covered and the quality of travel have changed considerably (Rau, 2015). Thus, modern ways of "consumption of distance" (Heisserer & Rau, 2017), including individual car traffic for daily commutes as well as and long-distance leisure travel all contribute considerably to greenhouse gas emissions, (Wiedenhofer et al., 2018). In this context, the time-related rebound effect (Binswanger, 2000; Brenčič & Young, 2009; Jalas, 2004) has become a focus of research. This describes the phenomenon that time freed through efficiency gains is often filled with additional, energy-intensive activities, instead of contributing to their reduction. Brenčič and Young (2009) found that Canadian households owning timesaving appliances such as dishwashers and microwaves were also more likely to own consumer electronics like VCRs. Attempts to save time, therefore, often lead to an increase in resource consumption and greenhouse gas emissions (Sorrell et al., 2020). Accordingly, considering time as a dimension of sustainability needs to include both looking at the

⁶ Consumer society is considered a "dominant system of social organisation" of contemporary societies (Cohen, 2017, S. v) which developed as a means of dealing with industrial overproduction. In this context, the consumption of goods and services serves the construction of identities and the display of status and is thus an essential form of communication (ibid.). Furthermore, it is associated with issues of environmental degradation, as well as exploitation of workers and thus global inequality, making it a main driver of the present climate and sustainability crisis (Smart, 2010).

quantitative aspect of time use as well as the qualitative aspects, including individual needs and social norms which are behind it.

The consideration of both quantitative and qualitative aspects of time use allows to better understand the phenomenon of time scarcity. It can be partly explained by individuals' difficulties in synchronising the different social times. In addition, sustainability scholars point out that the increasing decoupling of social and biological rhythms is also relevant here. Lucia Reisch, for instance, describes the global environmental crisis as a "clash of different time scales" (2001, S. 371), because rapid social change along with technological innovation is increasingly disconnected from the slower rhythms of nature and cycles of regeneration (Held, 2001; Mazzocchi, 2020; Rinderspacher, 2019). This has led to insufficient consideration of the impact of current actions on the future, such as the conservation of natural resources (Reisch, 2001), and a lack of awareness of the importance of biological rhythms for the local and the global ecosystem (Longo, 2021). As a result, political scientists have argued that a conception of time that mostly ignores the social and biological elements is one of the main reasons governmental institutions cannot think strategically (Bornemann & Strassheim, 2019; Handoh & Hidaka, 2010).

In terms of the individual, there is growing evidence about how the inability to reconcile individual time-related needs with social time demands affects well-being. Wittman et al. (2006) describe the "social jet lag" (ibid.) as a mismatch between a person's biological and social timing, resulting from the inability to align their daily schedule with their circadian rhythm. It occurs when, for example, work or school times interfere with preferred sleep times during longer periods. According to the authors, the social jetlag promotes unhealthy behaviours, such as smoking and an increased consumption of stimulants, e.g., caffeine. They also found evidence of a greater tendency towards depression among those affected. Moreover, adolescents and young adults are particularly affected by social jet lag (ibid.).

Following this overview of current research inquiring into the relation between time use and sustainability, I want to briefly turn to outlining some suggestions for how to address the problems raised above. So far, this has most prominently been done in relation to work time policies, mostly by economists. In addition, there are more comprehensive concepts such as that of time wealth, which suggests an alternative definition of wealth, departing from the idea of wealth in goods.

Since time scarcity is considered one of the main causes of unsustainability, increasing leisure time by reducing working hours has been suggested as an important lever to change this. The assumption implied is that individuals might consume less and also more sustainably if they dispose of more free time and less income (Chai et al., 2015; Hansen, 2015; Schor, 2005, 2011). Evidence from research conducted in Germany (Buhl & Acosta, 2016) and the US (Schor, 2005) shows, however, that work-time reduction alone does not lead to more sustainable behaviour. Accordingly, the findings from Lindsay et al. (2020) suggest individuals' time use is related to their attitudes and mind-sets. Thus, individual consumers will need to consciously choose to spend their time more sustainably. Thus, Wiedenhofer et al. (2018) recommend extending existing policy initiatives aiming at work time reduction by measures which are for once targeting individual consumers and also the wider structural issues influencing time use and energy consumption. This would include focusing on mobility, childcare, and infrastructures for leisure and recreation.

To complement individual measures such as reducing working hours, some scholars propose a more comprehensive approach to redefining our understanding of wealth: replacing the idea of wealth in goods with the idea of a wealth in time (Reisch, 2001, 2015; Rinderspacher, 2019). Proponents argue that this would lead to individuals' increased well-being and a reduction in levels of consumption (Galak et al., 2013; Geiger et al., 2021; Kasser & Sheldon, 2009). Time wealth is defined as:

“a state in which people experience (1) first and foremost a reasonable amount of discretionary time (sufficient time) that facilitates (2) adequate time per activity (unhurried pace) at (3) a sufficiently stable horizon of expectation (plannability) under (4) sufficiently self-determined conditions (sovereignty) where they can (5) satisfactorily coordinate different temporal requirements (synchronization).”
(Geiger et al., 2021, p. 2)

While research on the relation between time and sustainability is increasing (Geiger et al., 2021; Jouzi et al., 2021; Rau & Edmondson, 2013), the idea of time wealth has not yet caught on at a broader societal level. There are, however, various movements and groups exploring alternative approaches to time, such as Slow Food (Dunlap, 2012), sufficiency (Speck & Hasselkuss, 2015) or thrift (Holmes, 2019). More recently, there seems to be a slowly but steadily increasing demand for reducing work time in favour of a more even work-life balance, especially among younger generations (Lundqvist, 2019; Pasko et al., 2021). This is evident in several social experiments focusing on a reduction of work hours, including one currently implemented in Great Britain (*4 day week global. UK pilot programme*, o. J.) and a recent four-year trial in Iceland (Haraldsson & Kellam, 2021). Most recently, the collective experience of changed time experiences and routines during the COVID-19 pandemic has sparked further interest in the societal organisation of time (Jordheim, 2021; Klaver & Lambrechts, 2021; Ogden, 2020).

In summary, the current societal organisation of time seems to be a source of stress and reduced well-being for many people. From the perspective of sustainability science, this is considered one of the main causes of unsustainability. While there are currently several debates and trials to change established patterns of time use, these are mostly not linked to the sustainability discourse. As my research takes place in the school environment, I will focus on how time is approached in education in the next section where I will, again particularly look at whether and in how far time is linked with sustainability in this context.

2.1.3 Time and education

Since school is a part of society, it seems plausible that the way time is addressed in school corresponds to the way time is addressed by the wider society. In the following, I will focus on three aspects of time and school, which I consider particularly relevant regarding my empirical research. These include: (1) the organisation of time in formal education, (2) time to teach curriculum content, and (3) alternative pedagogical concepts of time.

Time within most contemporary state-run schools is a central means of organising institutional processes⁷ (Duncheon & Tierney, 2013; Gravesen & Ringskou, 2017; Mayes, 2005). Here, it is conceived of as a scarce resource to be used efficiently in- and outside of the classroom (Brannen & Nilsen, 2002; Dornbach, 2014b; Masschelein & Simons, 2015) and a neutral “backdrop of human agency” (Colley et al., 2012, S. 373), rather than as a key element of pedagogical processes. Time is thus mostly equalled with objective time. According to educational scientist Sabine Schmidt-Lauff (2012) this is one reason for time being an under-theorised concept in education research.

Considering time as a key element of organisation and regulation within formal education is relevant; the timetable is probably the most obvious example. What’s more, in many contemporary societies, with their focus on measurability and comparability of educational outcomes, learning is tied to time-related goals (Buddeberg & Hornberg, 2017). Thus, students are expected to and rewarded for achieving certain outcomes within a pre-defined time span, such as reproducing certain curricular content during end-of-year exams. According to Gravesen and Ringskou (2017) this considerably limits students’ temporal autonomy because it leaves little space for their individual needs regarding tempo and pacing.

Through the various ways time is organised at school, it is also a significant part of the hidden curriculum (Biesta, 2009; Dornbach, 2014a; Franch & Souza, 2016). The concept of a hidden curriculum refers to learning and teaching about practices, rules, or norms as a by-product of classroom teaching of curricular content (Skelton, 1997). Regarding time, this means that even where students are not explicitly taught about particular norms or practices related to time, they will still internalise these through the way their time is regulated, e.g. through timetables or the timing of assignments (Dornbach, 2014a; Thing et al., 2015). In addition, even free times are often regulated in such a way that students are not allowed to take individual breaks, but have to participate in collective break times. The structuring of time in school thus leads to students’ learning often being interrupted because the institutional arrangements require teachers to do so (Wahne, 2020). In addition, school has a significant impact on young people’s time in the sense that they spend a considerable amount of their life-time in educational institutions, for secondary students this often equals the time for full-time work (cf. Breidenstein, 2006)⁸. In fact, educational scientists have pointed out that the present organisation of time within education still resembles a 19th century “factory model” (Sliwka & Klopsch, 2020) approach, characterised by the goals of efficiency and outcome orientation (Buddeberg & Hornberg, 2017; Compton-Lilly, 2016). This is also reflected in school curricula. Even

⁷ I define **institution** as a public, governmental body that has a specific function within the society in which it operates. According to Biesta (2009, 2020), school as a societal institution has the following functions: professionalisation, socialisation and subjectification (see also Paper 4).

Following from this, I understand the individual school as an **organisation** in the sense of recent organisational research (Yanow & Geuijen, 2009), according to which these are units that are delimited from the outside, while also dynamic and changing, and which are made up of an individual composition of actors. **School as an institution** in this sense is thus part of the state-organised education system and functions according to certain rules and specifications. The individual school, in turn, is an organisation that implements these specifications according to its internal, school-culture-specific symbolic order in the field of tension between possibility and limitation (Helsper, 2009).

⁸ According to a non-representative study, German secondary students spend an average of 38.5 hours per week with school-related tasks (United Nations Children’s Fund (UNICEF), 2012).

though the idea of subjective time is conveyed in religious and philosophical studies and social sciences, an overall approach of teaching time as an objective, measurable unit, and focusing on time management, seems to be dominant (Dornbach, 2014b; Görtler, 2016a). This is also a main finding presented in Paper 2 (Grauer et al., 2022).

Based on what has been said so far, schools seem to promote time norms and practices that are associated with unsustainable behaviour. Indeed, there is some evidence that the conflicts mentioned in section 2.1.2, which result from the increasingly complex social organisation of time, are also visible in the school environment. According to educational scientist Sandra Leaton-Gray (2017), the approach to time in formal education limits students' individual autonomy over their time. She argues that the experience and use of time always depends on individual biography. This, according to Leaton-Gray, may further reinforce existing inequalities, for instance, for students with 'too little' time for school (because they have to look after siblings or earn money). Similarly, researchers focusing on time and sustainability in education criticise formal education settings for prioritising efficiency and speed over ensuring students' qualitative experiences of time (Beljan, 2018; Reheis, 2006). Thus, it seems reasonable to assume that the approach to time taught in modern schools may have contributed to negatively affect sustainability. Overall, however, the empirical evidence behind this claim is still insufficient.

Discussing time in school would be incomplete without mentioning that there are, in fact, various pedagogical approaches seeking to establish alternative ways of using time in educational settings. Even though these mostly do not link time use and sustainability, they still seek to enable learners to better align their individual time-related needs with the goals of education. For instance, by letting students themselves decide which kinds of content they will work on within a time (Häcker, 2017). These approaches can be subsumed under terms such as self-directed or self-determined teaching (Blaschke, 2012; Brenner, 2022; Schunk & Zimmerman, 1997). They may be applied at various levels, including individual subjects (Brandenberger et al., 2018), comprehensive learning settings such as e-learning (Saks & Leijen, 2014) or even guide the organisation of the entire timetable (Aquarone, 2021).

As already mentioned, however, while these pedagogical approaches seek to increase learners' autonomy over their time, they do not relate time to the normative goal of sustainability (Reheis, 2007). They may, as Breidenstein and Rademacher (2013) point out, even cause an increase in time pressure through shifting responsibility for learning success from the teacher to the individual student. In pedagogical contexts characterised by the principles of accountability and outcome-orientation, time use becomes a factor for success rather than a means for students to learn to structure and pace their learning in line with their individual needs (Compton-Lilly, 2016; Häcker, 2017).⁹

In this respect, the overall approach to time within formal education corresponds to the presently dominant idea of time as a scarce resource to be used efficiently. Since it is a main institution responsible for reproduction (Fend, 2008) and for qualification (Biesta,

⁹ I would like to add that even in those educational settings I have described as limiting students' time-related autonomy, students are creative actors, able and willing to "trick time". This refers to "the many different ways in which people individually and collectively attempt to modify, manage, bend, distort, speed-up, slow down or structure times they are living in" (Moroşanu & Ringel, 2016). Franch and Souza (2016), for instance, describe how Brazilian high school students carve out time for social relations by packing up and thus forcing teachers to end lessons early.

2009, 2020) it is clear why school would transport this idea and approach to time. Yet, as Biesta points out (ibid.) school also has the functions of socialisation and subjectification. This means that school imparts certain values, norms and competences, equally preparing students as future professionals and as individuals who actively take part in shaping their society. In view of the existing challenges of the global climate and sustainability crisis, there is therefore a need to enable students to identify and cope with future professional and societal challenges (Selby & Kagawa, 2018; United Nations Educational Scientific and Cultural Organization (UNESCO), 2020a; Wals & Corcoran, 2012). Related to time, there is evidence allowing for the conclusion that the school system has so far been insufficiently prepared for changing temporal demands in society and especially in the professional domain (Dornbach, 2014b; Grauer et al., 2022). Since implementing Agenda 2030¹⁰ is considered a key goal of education systems (United Nations Educational Scientific and Cultural Organization (UNESCO), 2021), and the above-mentioned research shows that time use is an important factor for sustainable development, it thus seems relevant to further inquire into how to promote the idea of time as a dimension of sustainability within ESE and thus general education.

So far, there is little research on time as a dimension of sustainability in school education. I am aware of only few conceptual works, such as those of German political scientists Fritz Reheis and Michael Görtler, each arguing in favour of adding time as a dimension of sustainability to political science education (Görtler, 2016b, 2016c; Reheis, 2006, 2019). They propose to increase learners' awareness of intra- and intergenerational aspects of sustainability by promoting the approach of "ecology of time" (Adam et al., 1997; Held & Geißler, 2000)¹¹, and through introducing alternative models of wealth, such as the time wealth approach (Reisch, 2001). There is, however, no empirical research associated with any of these. There are a few learning materials on time and sustainability (Butler et al., 2012; Grauer et al., 2021) and there is some empirical research on concrete pedagogical approaches such as "time honoured" (Armstrong, 2011; Campbell & Timmerman, 2007), attempting to include the time dimension to a place-based ESE, but it seems that neither seem to be referenced often. Finally, there are some recent conceptual papers by ESE researchers promoting alternative concepts of time to enhance learners' understanding of the relation between time and sustainability (Nairn et al., 2021; Pacini-Ketchabaw & Kummen, 2016; Winter, 2020).

In summary, time in school, as in the wider society, seems to be mostly approached as an objective unit of measurement and a scarce commodity. This is considered one cause for students often being unable to realise their individual time-related needs in relation to school. Yet, it is still unclear to what extent time is addressed in sustainability in curricula as well as within classroom teaching and school organisation. It is also unclear which kinds of pedagogical approaches might be suitable to address the empirical findings on time, sustainability, and the connection with individual needs presented above within a

¹⁰ Agenda 2030 is the UN framework defining 17 Sustainable Development Goals aiming at fostering sustainability and eradicating poverty until 2030. It explicitly refers to ESE being a key strategy for achieving these goals (United Nations (UN), 2015).

¹¹ The approach of time ecology, developed in Germany in the 1990s, considers the climate and sustainability crisis as mainly a time crisis, stemming from contemporary society having essentially lost connection to nature's rhythms including those of reproduction and regeneration (Adam et al., 1997). It thus calls for a new societal approach to time at all levels, enabling individuals and society as a whole to realign with ecological rhythms.

framework for school-based ESE. Before I return to this goal of my research, I will first present the research field of ESE in the following section.

2.2 Staking the research field

In this section, I will first focus on some of the current critical debates within ESE rather than provide a general introduction to the field because others have already done so (Barth et al., 2016; P. Jones et al., 2010; Kopnina, 2013; Selby & Kagawa, 2015; Wals & Kieft, 2010). These ongoing critical controversies within ESE address the function of ESE, its goals, and its effectiveness. These issues apply to contemporary ESE, so I will first briefly introduce each of them and then position myself within the field. I will then proceed with introducing transformative learning, considered a promising approach for reaching the goals of contemporary ESE.

ESE is the attempt to introduce the vision of sustainability into education systems worldwide. Building on the established tradition of environmental education and the 1987 Brundtland definition of sustainable development, the Rio Summit established Education for Sustainable Development (ESD) as a key element to implement Agenda 21 (Hasslöf, 2015; United Nations Conference on Environment and Development (UNCED), 1993).¹² Today, ESE is widely regarded as an essential contribution to achieving the UN Sustainable Development Goals (SDGs), and the UNESCO has proposed its *ESD for 2030* framework, identifying five priority areas for promoting ESE at various levels ((United Nations Educational Scientific and Cultural Organization (UNESCO), 2020b). These include: (1) advancing policies at global, regional and national levels; (2) improve learning environments by promoting whole institution approaches; (3) providing capacity development opportunities for educators; (4) Increasing opportunities for youth engagement; and (5) empowering local communities¹³.

At present, ESE is increasingly being mainstreamed into education policies and curricula at national and regional levels (Holst et al., 2020; Jucker & Mathar, 2015; Niedersächsisches Kultusministerium, 2021). It is, however, far from being a uniform field. Rather, it is characterised by diverse strands of practice and research (Barth, 2014; Jones et al., 2010; Leicht et al., 2018; Lozano et al., 2019; Selby & Kagawa, 2015; R. Stevenson et al., 2013) which becomes clear through several critical debates within the field; three of which I consider especially relevant to my research focus:

- (1) Role/Function: the debate on the suitability of ESE to implement the vision of sustainability in the context of an unsustainable system
- (2) Goal/aim: the discussion of an instrumental versus emancipatory view on education
- (3) Achievements: the lack of evidence for ESE's effectiveness

¹² See the note on terminology in the introduction where I explain my choice of ESE over ESD.

¹³ By presenting the five priority areas, I do not suggest endorsing the UNESCO's framework. As various authors quoted in this section have pointed out, international frameworks such as this one have to be assessed critically because of the norms and values regarding the idea of sustainable development which they promote. Nevertheless, because my research focuses on ESE within formal education, international policies are relevant when it comes to formulating suggestions for ESE activities in this context. Therefore, I present the priority areas here, and will come back to them when discussing the implications of my findings in section 5.2.

First, there is an ongoing debate about whether embracing the concept of sustainable development contributes to perpetuate an unsustainable neoliberal growth agenda and thus discourages rather than enables learners from engaging with solutions to the global climate and sustainability crisis (Kopnina, 2020; Selby & Kagawa, 2011). This is countered by the view that there is no alternative to ESE given the urgency of the crisis (McKeown & Hopkins, 2003) and that education, even outside ESE, is never neutral but always reflects certain values and ethics (Fien, 1997).

Accordingly, there is the critique that ESE risks undermining its own claims as long as it promotes “business as usual” (Huckle & Wals, 2015). They argue that ESE so far has not sufficiently addressed that learners need to identify the systemic causes of the current global climate and sustainability crisis. Such an effort would also include ESE continuously questioning and adapting its foundations and values. Only in this way can it enable learners to do the same, and in the process enable them to “unlearn non-sustainability” (Selby, 2015; Wals, 2010). This, some suggest, may be achieved by promoting transformative, transgressive forms of learning to aim at enabling learners to transcend existing structures and continuities, especially by exposing hegemonic power structures (Bengtsson, 2019; Macintyre & Chaves, 2017).

This ties in with the second debate, which focuses on what and how learners are supposed to learn. It has at its core the idea whereby there is the danger of indoctrinating learners towards the inherently normative goal of sustainable development rather than enable them to arrive at their own conclusions and positions regarding sustainability (Jickling, 1992; Jickling & Wals, 2008). In this context, Vare and Scott (2007) identified two “interrelated and complementary approaches” (ibid., p. 193) which they term ESD 1 and ESD 2. ESD 1 is described as “learning *for* sustainability” (ibid., emphasis in original), and thus representing a “more limiting instrumental view of education” (ibid., p. 196) while ESD 2 stands for “learning *as* sustainable development (ibid., p. 193, emphasis in original), focusing on critical thinking and thus representing an “emancipatory” (Wals et al., 2008) approach to education.

Similar to Vare and Scott (2007), other authors, too, emphasise that the two approaches are in fact complementary because learners need to have certain factual knowledge and the ability to evaluate and reflect on their individual positions, values, and visions for a social-ecological transformation (Fischer & Barth, 2015; Sterling, 2010). Sterling (ibid.) therefore proposes the term “education as sustainability” (2010, S. 523), highlighting the emancipatory, transformative perspective of ESE and the vision of ESE “where the process of sustainable living and developing resilience is essentially one of learning, whilst the context of learning is essentially that of sustainability” (ibid.). Yet, ESE researchers criticise that the concept of ESE presented in most official policy documents (Rieckmann, 2021), and thus also within educational practice (Grundmann, 2017), still largely corresponds to the instrumental ESD 1 view (see also Singer-Brodowski, 2016c). Contemporary ESE research and practice therefore face the challenge of overcoming this approach to sustainability education. One suggestion to achieve this goal is for researchers and practitioners to embrace the potential of ESE as “education as sustainability”, seeking to enable learners to develop and critically evaluate longer-term perspectives while facing an increasingly uncertain future (Lotz-Sisitka et al., 2016; Mogren & Gericke, 2017; Wals, 2011).

A third critical debate revolves around the fact that evidence of the effectiveness of ESE is scarce. This concerns both pedagogical interventions (Boeve-de-Pauw et al., 2015) as well as effects of mainstreaming of ESE in school administration and management (Verhelst et al., 2021). It also refers to the assessment of sustainability-related learning outcomes (Redman et al., 2021 see also section 2.2. Wilhelm et al., 2019). The lack of evidence leads to “decisions and implementation strategies rely[ing] heavily on policy recommendations and practitioners’ gut feelings” (Boeve-de-Pauw et al., 2015, S. 15693). Researchers are well aware that ESE is fraught with “large and extensive [...] expectations” (Barth, 2014, S. 110) due to its interdisciplinary approach and pluralistic learning approaches. In addition, conventional research is often not designed to inquire into longer-term effects of ESE (Olsson et al., 2022). To substantiate its own claims and relevance, however, ESE might certainly benefit from addressing the issue of effectiveness. I cannot find a solution to this problem within the limited scope of this dissertation. However, while I share the view that ESE is an important contribution towards enabling societies to handle the global climate and sustainability crisis, I believe it is important for both researchers and practitioners of ESE to be aware of the debate on its effectiveness while reflecting on and seeking to develop their own work.

In view of the three debates briefly presented, I will proceed with introducing the approach of transformative learning, which is characterised by its reflective stance and thus considered promising to meet the goals of ESE.

Transformative learning in ESE

Originating in adult education (Mezirow, 1978), transformative learning theory subsequently developed into an established learning theory within education research (Howie & Bagnall, 2015; Taylor & Cranton, 2012) as well as ESE (Boström et al., 2018; Rodríguez Aboytes & Barth, 2020; Singer-Brodowski, 2016c). Transformative learning has now become a key approach in international strategies for implementing ESE (Organisation for Economic Co-operation and Development (OECD), 2020; United Nations Educational Scientific and Cultural Organization (UNESCO), 2021). In the following, I will use the term transformative learning to describe an approach of process-oriented emancipatory ESD 2 aimed at fostering reflexivity in learners, enabling them to contribute towards a sustainability transformation of society (Balsiger et al., 2017; Singer-Brodowski, 2016b). Similar to Mezirow (1978, 2009), I understand transformative learning as a process of perspective transformation following the learners’ encounter with a disorienting dilemma. Confronted with the fact that existing frames of references no longer suffice to handle a certain situation, learners start to question established meaning perspectives through critical self-reflection and discourse until they arrive at a meaning transformation. In addition, I share Mälkki’s (2015) criticism of Mezirow’s approach to reflection, which she considers focusing too much on learners’ cognitive activities. In response, she proposes a more comprehensive concept of reflection that includes not only the cognitive but also the emotional processes of learners, especially when such processes are triggered by crises (ibid.). Mälkki emphasises that this requires special care in the facilitation of such processes.¹⁴

¹⁴ This requires from facilitators to create “a safe and accepting atmosphere” (Mälkki, 2015). It also requires facilitators who themselves are able to constantly reflect on their attitudes towards learners and their overall approach to facilitation (ibid.; see also Abels, 2011).

Transformative learning has become a key pedagogical approach for implementing an emancipatory ESE at all levels, even though evidence on how to assess its impact is scarce (Rieckmann, 2018) and ESE lacks a shared understanding of the concept (Singer-Brodowski, 2016c; Walshe & Sund, 2022). Research on the implementation and effects of transformative learning in formal educational settings mostly focuses on higher education (Tillmanns, 2020), teacher education (Öhman & Sund, 2021) or organisational learning (Schnitzler, 2019). It is fairly recently that research has begun to focus on adolescent education, for instance, by exploring the potential of arts education (Bentz & O'Brien, 2019), tackling issues of power and social justice with vulnerable youth (Kayumova & Tippins, 2021) or concrete topics such as sustainable food choices (Jones, 2020). The latter three studies have in common that they present findings from researching pre-designed learning approaches aimed at fostering transformative learning in adolescents. There is, to my knowledge, no study to date about students' everyday experiences as potential resources for transformative learning, which is the focus of the exploratory study presented in Paper 4. Educational research has, however, shown that it may be beneficial for students' learning when teachers aim at integrating students' "funds of knowledge" (Moll, 2019, S. 131), i.e. the practices and knowledge developed and accumulated during their lives into classroom teaching (González et al., 2005; Whittington et al., 2022).

In summary, I consider ESE a significant pedagogical approach to contribute to the transformation of a currently unsustainable system. The approach of transformative learning, self-reflection and learning from peers seems to be suitable for this in so far as it corresponds to the values of an emancipatory ESE. In particular, it seems suitable for unlearning non-sustainability (Wals, 2010) if it is accompanied by the intention of "anti-consumer education" (Selby, 2015, p. 28). Selby considers the global climate and sustainability crisis as rooting in Western affluent societies' consumption-oriented lifestyles. Accordingly, the task of ESE is enabling learners to recognise the causes and consequences of their lifestyles and to question their own position and role in this context. This particularly includes the confrontation with feelings and needs and thus a confrontation with the self, which can be painful, Selby notes (*ibid.*).

Before returning to the importance of addressing inner values and needs for sustainability, I would first like to introduce the ESE sub-field of ESC in general.

2.2.1 Education for sustainable consumption (ESC)

Like ESE, the concept of sustainable consumption was introduced to the global sustainability discourse through the Agenda 21 process (Cohen, 2010) and it is now considered a core element towards achieving the Sustainable Development Goals (SDG) (United Nations (UN), 2015). SDG Goal 12 explicitly calls for ESC under target 12.8, aiming at "ensur[ing] that people everywhere have the relevant information awareness for sustainable development and lifestyles in harmony with nature" (*ibid.*).

Initial approaches to ESC emerged under the umbrella term of sustainable consumption and production (SCP) (Thoresen, 2015). These approaches mostly aimed at giving consumers information about their rights, thus empowering them vis-à-vis producers (McGregor, 2005, 2015). Yet, critics argue these approaches mostly failed to address the neoliberal growth paradigm underlying present consumer society because they mostly focused on individual consumer education, while only rarely addressing the

systemic causes of unsustainable consumption (Cohen, 2019). While this opinion is shared by ESC researchers, they still argue in favour of an ESC targeting individual consumers as learners, yet under different, more holistic and value-based premises (Álvarez-Suárez et al., 2013; Bamberg et al., 2021; Böhme et al., 2018), such as the concept of “consumer citizenship” (Thoresen, 2015, S. 16–17). This approach seeks to foster consumers’ ability to recognise and evaluating the political, structural, and thus sustainability-related causes and effects of their consumption decisions.

A second strand of criticism relates to the fact that consumer education has long focused predominantly on adults as consumers, resulting in a lack of approaches to and evidence for the effectiveness of ESC interventions aimed at young people (Fischer et al., 2017; Hadjichambis et al., 2015; Kopnina, 2013). These authors note that children and young people have different needs as consumers than adults and that they are subject to certain constraints and have a lower degree of decision-making capacity. Thus, they need to be addressed differently than adult consumers. This is also increasingly recognised by international frameworks such as the UNESCO’s ESD for 2030 framework (United Nations Educational Scientific and Cultural Organization (UNESCO), 2021) which identifies the need for more holistic, values-based educational activities related to sustainable consumption.

So far, this has not widely been integrated into school-based ESC. This seems still mostly characterised by a focus on knowledge transmission, as a recent study from Germany shows (Schütte, 2020). The study examined secondary school curricula on consumer education (“Verbraucherbildung”) and finds that ESC is largely taught via an ESD 1 approach focusing on knowledge transmission and individualising responsibility for sustainable consumption rather than addressing a more comprehensive, systemic concept of sustainable consumption. Böhme et al. (2018) report similar findings and also argue in favour of promoting a transition of ESC towards pedagogical approaches addressing a variety of domains and competences, including personal norms, values, and emotions. This brings me to the next section, focusing on what learners should learn in educational contexts focusing on sustainability.

2.2.2 What to learn within ESE? Key competences for sustainability

Sustainability-related problems are “wicked problems” (Rau & Edmondson, 2013; Wiek et al., 2011), meaning they comprise many interwoven aspects that make it impossible to find simple and generalisable solutions. Considering the related discussion about the emancipatory potential of ESE, a key academic debate has evolved, aiming at defining corresponding learning outcomes, termed key competences for sustainability (Bianchi, 2020; Brundiers et al., 2021)¹⁵. In this section, I will first summarise this debate before comparing the notions of time in some of the most frequently cited frameworks for key competences in sustainability (Table 1).

¹⁵ I use the terms “competence/competences” instead of “competency/competencies”, which are used widely in the ESE literature. Bianchi (2020) points out that some non-native English-speaking authors seem to use “competencies” incorrectly as the plural of the term “competence” (ibid., p. 8f). I also draw on Vare et al.’s (2022) overview of different understandings of competence concepts, which identifies a broader definition of competence including cognitive, affective, volitional and motivational elements, tied to “an individual’s increasing maturity and autonomy” (ibid., p. 4).

The debate on key competences for sustainability relates to the debate on competence-based education, which has gained momentum in educational research and policy since the 1970s (Hyland, 1993); especially during the turn from input-oriented to output-oriented education from the 1990s onwards (Glaesser, 2019). This is considered a paradigm shift in education, turning the focus from knowledge transmission towards empowering learners to acquire and develop knowledge, skills, abilities, and dispositions to meet the demands of contemporary society (Heinrich, 2007).

There has been much criticism of competence-based education. According to Glaesser (2019), for example, it promotes a neoliberal understanding of education that sees students predominantly as future workers and employees. Focusing on the OECD's PISA studies she argues that these kinds of international comparative studies have caused education policies of OECD member states being primarily oriented towards measurable learning outcomes. As a result, Glaesser writes, the learning progress of individual students is no longer the main goal of education. Frohn and Heinrich (2018) point out, however, that competence-based education per se is not to be criticised. Rather, they argue it is a matter of their implementation. Regarding Germany, they criticise a too narrow understanding of learning in both teacher education and classroom practice where competence orientation is understood as performance assessment instead of a more comprehensive focus on the needs of individual learners (ibid.).

Within ESE, an influential definition of competence is proposed by Weinert (2002): "the cognitive abilities and skills that individuals have or can learn to solve specific problems, and the associated motivational, volitional, and social dispositions and abilities to use problem solving successfully and responsibly in variable situations" (Weinert, 2002, S. 27f transl. by author). This definition underlies the OECD DeSeCo¹⁶ concept of "key competencies for a successful life and a well-functioning society" (Rychen & Salganik, 2003) as well as de Haan's concept of "Gestaltungskompetenz" (2006) which remains the most influential concept for implementing ESE policy and practice in the German-speaking context, especially in K-12 education (Fischer & Barth, 2015; Kehren & Bierbaum, 2018).

In contrast to single competences, which are domain-specific, key competences comprise several cross-cutting competences and are thus relevant across domains (Rieckmann, 2010). Both competences and key competences can only be observed in action, and they develop over time (Rieckmann, 2018). Within ESE, key competences for sustainability are considered relevant regarding the ESD 2 approach and thus foster an emancipatory, transformative approach to sustainability learning (Sterling, 2010).

To date, most existing frameworks of key competences for sustainability focus on higher education (Barth et al., 2007; Brundiens et al., 2021; Rieckmann, 2018; Wiek et al., 2011, 2015) and only rarely on K-12 education (Frisk & Larson, 2011; Rodríguez-Aboytes & Nieto-Caraveo, 2018). The work of Wiek et al. (2011), Brundiens et al. (2020), and Redman & Wiek (2021), especially, aims to demonstrate convergence around an interrelated set of key competences in sustainability. At the same time, the debate is also characterised by differing use or understandings of terminology, their interpretation and

¹⁶ DeSeCo stands for Definition and Selection of Key Competencies, a project which aimed to arrive at a longer-term framework for key competencies. See also (Organisation for Economic Co-operation and Development (OECD), o. J.)

related practices, resulting in a general conceptual unclarity (Vare, 2022)¹⁷. In this dissertation, I use the term key competence in line with the definition proposed by Brundiens et al. (2021, S. 17):

“a set of interrelated competences [which] facilitates successful performance and a positive outcome that advances sustainability (given what is known, valued and aspired to at a given point in time) while working on specific sustainability challenges and opportunities in a range of contexts.”

I understand key competences for sustainability as interdependent and distinct from other key competences, such as academic competence. They need to be distinguished from concrete learning outcomes (Brundiens et al., 2021; Wilhelm et al., 2019) and yet represent important reference points for educators (Wiek et al., 2011). As they include cognitive and non-cognitive elements, the acquisition of key competences for sustainability should not be confused with the mere acquisition of knowledge (Barth et al., 2007). Finally, key competences apply across various contexts, whereas competences may well be context- or domain-specific (Brundiens et al., 2021; Rieckmann, 2012).

Since my research focuses on inquiring into time and sustainability in ESE, I examined how existing key competence frameworks understand time (see Table 1). I have selected several of the frameworks cited in reviews of Rieckmann (2018) Bianchi (2020) and Brundiens et al. (2021), focusing on those aiming at general (higher or K-12) education. This meant leaving out those frameworks focusing on technical or professional education (e.g. Quendler & Lamb, 2016). I also included the frameworks by Frisk & Larson (2011) and de Haan (2006) because both refer to K-12 education, and because of the latter's significance within the German-speaking education context.

For my analysis, I only selected those key competences, which contain explicit references to time. This means either that the competence itself focuses on the shaping of a lifetime, for instance, through referring to the future as a place that can be shaped through the acquisition of key competences. Or the key competence explicitly mentions time-related learning objectives, for example “concepts of time” (Wiek et al., 2011, S. 213). I have not included those key competences, which only indirectly relate to time use. Examples are “strategic-thinking competency” (Brundiens et al., 2021, S. 22) which also includes an understanding of historical roots of present conditions, or “competence in planning and implementation skills” (de Haan, 2006, S. 24) which implies the ability of planning and organising time which is, however, not directly referred to in its definition.¹⁸

¹⁷ There is no uniform understanding of the term “competence” (European Commission, 2022; Shephard et al., 2019), and, depending on varying national preferences, authors also use terms used instead of competence such as skills, literacy or capabilities (Sterling et al., 2017).

¹⁸ This also explains the absence of some often-cited frameworks from Table 2, including Barth et al. (2007), Glasser and Hirsh (2016), and Wals (2015) since neither of these contains any direct references to learners' understanding or shaping of time.

Table 1: Key competences explicitly referring to time

Time-related key competence	Definition	Reference to time (cf. section 2.1.1)	Framework
Anticipatory competence	“Anticipatory competence is the ability to collectively analyze, evaluate, and craft rich ‘pictures’ of the future related to sustainability issues and sustainability problem-solving frameworks. (...). The capacities to analyze, evaluate, and craft are based on acquired future-oriented knowledge including concepts such as time and uncertainty; peer-reviewed ‘classics’ such as the IPCC’s emission scenarios; as well as methods and methodologies such as simulation and scenario analysis. Overall, these skills are tailored to address key issues of sustainability, including unintended harmful consequences and intergenerational equity.”	Objective (“past, present future”) Subjective (“non-linearity”)	(Wiek et al., 2011, S. 208–209)
Anticipatory competency	Includes the dispositions of “developing sustainable ideas for the future, dealing with risks, dealing with change, precautionary principle” (transl. by myself)	Objective; idea of a future shape-able through ideas developed in the present	(Rieckmann, 2010, S. 122)
Anticipatory thinking	“Envisioning, analysis, and evaluation of possible futures, including scenarios with multi-generational timescales”	Objective, linear idea of time leading to “possible futures”	(Lozano et al., 2017, S. 4)
Competence in foresighted thinking	“The capacity to deal with uncertainty and future prognoses, expectations and plans characterises the sub-competence of being able to think beyond the present. It is essential that the future be understood as open and something that we can help to shape. This attitude underpins the capacity to develop different options for action based on present conditions. Through foresighted thinking and acting, we can	Objective, linear idea of time leading to an “open future”	(de Haan, 2006, S. 22–23)

Time-related key competence	Definition	Reference to time (cf. section 2.1.1)	Framework
	conceive of possible developments for the future and identify potential opportunities and risks inherent in present and future developments, as well as unexpected ones. Creativity, fantasy and imagination play an important role in this competence.”		
Future-thinking	“Visioning, developing scenarios, backcasting, recognising heritage, intergenerational equity”	Linear idea of time	(Giangrande et al., 2019)
Futures-thinking competency	“[T]o be able to iterate and continuously refine one’s own futures thinking (visions, scenarios, etc.), in productive and explicit tension to the status quo; recognizing the “implicitly held (and largely unrecognized) assumptions about how society works” and how they influence the status quo and critically reflecting how they might influence futures thinking.”	Objective idea of linear time and subjective idea of time expressed through “assumptions about how society works”	(Brundiers et al., 2021, S. 23)
Futures-thinking competence	“Ability to carry out or construct simulations, forecasts, scenarios, and visions: 1) to anticipate future states and dynamics of complex systems and sustainability problems; 2) to anticipate how sustainability action plans (strategies) might play out in the future (if implemented).”	Objective idea of a linear, open future that can be anticipated	(Redman & Wiek, 2021, S. 6)
Long-term foresighted thinking	“Foresighted thinking involves asking questions about long-term trends and possible future scenarios, while also employing anticipatory approaches to understand, mitigate, or adaptively prepare for future changes in system dynamics (Wiek, et al., 2011; Gibson, 2006). It also involves placing value on the future, taking responsibility and ownership of our impacts on generations to come, and promoting concepts of intergenerational equity.”	Objective idea of a linear, open future that can be anticipated	(Frisk & Larson, 2011)

The overview presented in Table 1 shows that where time is part referred to in relation to key competences, it predominantly refers to the notion of an open future that the (key) competent learner can shape. Time thus appears mainly an objective, external condition which proceeds linearly towards this open future. There are no direct references to time as a means by which individuals shape their daily lives (in the present and near future). This is, however, an important aspect within the debate on time and sustainability (see section 2.1.2).

The idea of an open future to be shaped through the acquisition of key competences for sustainability is conflicting with the concept of time, as conveyed by the formal education system. Time in formal education is approached from the perspective of the individual learner facing an uncertain future on which they will only have little influence, if at all (Holfelder, 2019). Amsler and Facer even argue that the formal education system “cannot cope with open, complex and undetermined futures” (2017, S. 8). This conflict between ESE’s rather optimistic attitude towards a shapeable future and formal education’s rather pessimistic notion of the future as potentially uncertain is thus a hitherto unresolved issue in relation to exploring pedagogical approaches to linking time and sustainability within ESE.

How then might it be possible to bridge these different conceptions of time to enable learners to relate personal short-term ideas of time with long-term visions for themselves and society overall? As shown in section 2.1.2, there is a relation between individuals’ subjective experience of time and the consequences this has regarding sustainability. Pedagogical approaches focusing on enhancing learners’ understanding of the relation between time and sustainability therefore would require extending the idea of time as relating to the distant future to individual learners’ understanding of their present time use. Such an understanding of time could thus contribute to the existing frameworks of key competences for sustainability (Amsler, 2019) as well as approach to time as it seems common within many formal educational institutions, such as schools (Beljan, 2018 see also section 2.1.3).

Here, it is important to address two issues that are currently being discussed among researchers interested in key competences for sustainability. First, there is disagreement about whether and to what extent key competence approaches may have too narrow a focus on cognitive aspects and how this could be addressed. Second, it is frequently pointed out that knowledge about the development of competences is still too scarce.

First, researchers have criticised existing key competence frameworks for placing a disproportionate emphasis on cognitive and discursive-intellectual aspects of learning and propose to include intrapersonal competences for sustainability (Frank, 2021; Giangrande et al., 2019). According to Brundiens et al. (2021) this position is challenged because intrapersonal competences might be considered attitudes of mind rather than of competences which can be taught. Yet, there is the opposite argument whereby it is indeed considered relevant for ESE to focus more on these intrapersonal competences (Burns, 2016; Wamsler, 2020) which is a position I share. Brundiens et al. (2021), for example, point out that a focus on intrapersonal competencies related to future thinking has the potential for learners to develop an awareness of emotions that influences personal visions of the future. This is relevant in the context of time and sustainability because, as stated in section 2.1.2, there seems to be a relation between time use and individual needs. The latter, however, are neither at the core of current key competence

approaches, nor of the present competence-oriented focus of education policy and practice.

Second, even though there is a general agreement that teaching about sustainability competences requires more than mere knowledge transmission (Barth et al., 2007), this has so far not widely been translated into ESE educational practice, which appears still mostly knowledge-oriented (cf. Backman et al., 2019). Although transformative, experiential learning approaches are considered promising for fostering both key competences (Caniglia et al., 2016) and intrapersonal competences (Frank & Stanzus, 2019), too little is known about how competence-based learning processes occur (Singer-Brodowski, 2016a). Moreover, there has been rather little research on how key competences can be developed and promoted in pedagogical settings so far (Lozano et al., 2017). In response, Wilhelm et al. (2019) emphasise the need to focus on implementing learning approaches to promote key competences rather than focusing too much on theoretical aspects of competence frameworks. Accordingly, my research will focus on how a pedagogical approach might look like that seeks to foster individual time use in the context of sustainability with a focus on individual learners and their needs. I will thus proceed with introducing recent research from scholars focusing on needs-based approaches to sustainable consumption.

2.2.3 The needs-based perspective on sustainable consumption and how to promote it in ESE

While previous perspectives on consumption and corresponding ESC interventions have mainly focused on consumer goods and their sustainability, a needs-based approach to sustainable consumption allows challenging the neoliberal growth paradigm inherent in ESE and ESC in particular. This approach understands consumption as an act of need satisfaction and thus brings into focus both the intentions and the effects of consumption rather than the individual acts of consumption (Di Giulio & Fuchs, 2014; Fuchs et al., 2021; Gough, 2017). Inspired by philosophical approaches to “the good life” of Martha Nussbaum (1992) and Manfred Max-Neef (1991) this approach distinguishes between objective or “Protected Needs” (Di Giulio & Defila, 2019) and subjective desires which require different satisfiers. It thus seeks to establish a qualitative approach to well-being as opposed to dominant growth-dependent quantitative approaches focusing on material wealth, which are considered drivers of the present climate and sustainability crisis (see also the reference to time wealth in section 2.1.2).

Protected Needs are what every human being needs to fulfil their aspiration of a good life, and they cannot be contested on ethical grounds (Di Giulio & Defila, 2019). Subjective desires, in contrast, are “individual sensations of wanting” (ibid., 105), and their satisfaction is only legitimate as long as this does not interfere with other human beings’ ability to satisfy their Protected Needs. The goal of sustainability, according to this view, is then “to provide all humans with the external (social, cultural, economic, environmental) conditions necessary to live a good life” (Di Giulio et al., 2014, S. 51). By focusing on individual needs instead of individual acts of consumption and relating these to intra- and interpersonal justice, this perspective has the advantage of providing a positive framing of the sustainable consumption discourse, unlike narratives emphasising aspects of downshifting or renunciation (Sahakian et al., 2021).

The needs-based perspective on sustainable consumption thus shifts the focus away from consumption acts to their impact on sustainability (Di Giulio et al., 2014). The aim of assessing both the intentions behind consumption acts and the actual outcomes or impacts in terms of sustainability is in line with the goals of the emancipatory approach of ESE. According to this perspective, learners can be empowered to question the growth paradigm inherent in sustainable development and realise the extent to which this also influences their own values, needs, and resulting behaviours. This then ties in with the debate on intrapersonal competences for sustainability. As mentioned above, individual needs play an important role in sustainable consumption. Moreover, they are relevant regarding the connection between individual time use and its impact on sustainability. I have already quoted David Selby's call for "anti-consumerism education" (2015, p. 28) which he relates to his proposal for a more prominent focus on individual learners' needs and values as related to their sustainability-related behaviour within ESE.

An approach which explicitly aims at fostering learners' intrapersonal competences in relation to sustainability is the pedagogy of SIBL (Frank & Stanzus, 2019). Based on a study with university students, Frank and Stanzus found this a promising approach for sensitising learners for their individual needs and thus fostering their individual awareness of sustainability-related values. The approach is based on the assumption that, to address their use of time, their individual needs, and sustainable consumption, learners need to explore their awareness of their inner states and processes (Wamsler, 2020). Applied within a context that focuses on time as a resource for sustainability, this would need to aim at enabling learners to explore and reflect on their emotions, their needs and values in relation to time use and sustainable consumption. Thus, such an approach might then contribute to improve learners' understanding of their individual time-related needs and thus potentially take action to change their time use patterns. It could also increase their individual well-being and reduce potential negative environmental impacts (Geiger et al., 2021). This idea is further explored by the studies presented in Papers 3 and 4 (Frank et al., 2022; Grauer et al., 2022).

2.3 Summary

In this chapter, I have presented the study of time through approaching it via three characteristics: objective, subjective, and biological. Drawing on evidence mainly from social science research, I showed how the contemporary approach to time as a scarce resource can be considered a driver of unsustainability. This includes social acceleration, individual feelings of time scarcity and the related difficulties of individuals to synchronise individual and collective times, as well as aligning individual biological needs with societal rhythms. In education, time mostly seems to be approached as an aspect of organisation and a scarce resource to be used efficiently. So far, the relation between time use and sustainability has not been explored widely in ESE. Given the reported findings on the importance of individual need satisfaction in relation to sustainable consumption and on the link between intrapersonal competences and sustainability, it thus seems valuable to bring together these different strands of research to develop a pedagogical approach to promote time as a dimension of sustainability in ESE.

3 Research Framework

“[C]locks slay time. (...) time is dead as long as it is being clicked off by little wheels; only when the clock stops does time come to life.”

William Faulkner (1994, S. 54)

In this section, I am going to present the research framework for my dissertation, starting with the research questions, followed by an introduction of the overall methodological approach and an introduction of the research design.

The evidence presented in the previous chapter establishes that there is a relation between time use and sustainability. It also draws attention to how time as a dimension of sustainability still seems to be under-explored within both ESE theory and practice. The established theoretical frameworks for key competences for sustainability mostly include time-related sub-competences, but these mostly refer to time as the more distant future, rather than engaging individuals with present, individual time-related needs and their relation to sustainability. This dissertation therefore aims to inquire into the potential of pedagogical interventions for foster an awareness of time use that focuses on the perception of individual needs, their impact on time use, and the consequences in terms of sustainability.

The research was guided by the following research questions:

How can ESE address the relation between time and sustainability in formal education and thus enable learners to use time more sustainably?

- Sub-RQ1: What competences do students need to use time sustainably?
- Sub-RQ2: How is time as a resource for sustainability addressed in German education curricula?
- Sub-RQ3: In how far do experiential and self-inquiry-based pedagogical approaches promote the development of time use competence and transformative learning processes within ESE?

Because of its commitment to providing practice-oriented solutions, Reunamo and Pipere (2011) have characterised ESE research as “agency-driven and change-oriented” (2011, S. 111). This, Dillon and Wals (2006) argue, necessitates a strong reflexive position on the researcher’s behalf, particularly about her personal motivation to contribute to the goals of ESE. Because ESE researchers “cannot be neutral in their work and that their background and bias affect what, who and how they research” (R. B. Stevenson et al., 2013, S. 516), they need to continually evaluate their work and its intended and unintended effects.

Since ESE is a relatively recent academic discipline, combining research traditions from multiple disciplines, various scholars have emphasised the need for clarity about epistemic assumptions and related methodological choices (Hart, 2013; R. B. Stevenson et al., 2013). To help ESE researchers examine and gain clarity on their ontology (what are we dealing with?), epistemology (how can we find out about it?), and axiology (from whose personal perspective are we doing our research?), Dillon and Wals (2006) presented a framework for three representations of ESE (see Table 2).

Table 2: Three (simplified) representations of environmental education research (Dillon & Wals, 2006)

	Research as evidence	Research as co-learning	Research as activism
Modus of understanding	Empirical analytical	Hermeneutic–interpretive Holistic–descriptive	Socially-critical
Locus of impact	Universal	Trans-contextual	Contextual-transformative
Key research competencies	Good tester, designer and modeller	Good listener, interpreter and storyteller	Good ally, critical friend, advocate
Main researcher modes	Passively-detached Neutral expert objective	Actively-detached Passively-engaged Explicitly-biased	Actively-committed Explicitly-partisan
Role of the researched	Source of data	Active informant Co-learner	Change agent Co-learner
Desired outcomes include	Explanatory models Tests of hypotheses Definitive answers	Improved understandings Thick descriptions Increased (self) awareness	Transformation (Systemic) change

The research for this dissertation uses a qualitative approach, combining a constructivist and a critical research paradigm (Dejaeghere et al., 2020; Guba & Lincoln, 1994). According to the constructivist paradigm, human beings continually choose and incorporate new pieces of knowledge while always responding to a specific socio-cultural environment. This is how they actively construct their knowledge (Hammersley, 2013). The aim of research is thus attempting to improve the understanding of these processes by which individuals create and construct knowledge to make sense of the world around them (Hyslop-Margison & Strobel, 2007). In educational research and practice, constructivist approaches are among the most influential paradigms in the past decades (Krahenbuhl, 2016). Constructivism is an umbrella term for different approaches and theories, which all agree on the basic assumption that learners are constructors of their own knowledge. New knowledge is created through individual and social interactions, leading individuals to link new experiences to their pre-existing assumptions, ideas, values, and prior knowledge (Biggs, 1996). Learning processes are therefore considered idiosyncratic and denote forms of individual representations. Consequently, research seeks to better understand individuals' constructions of knowledge through reconstructing processes of knowledge construction by using adequate research methods (Guba & Lincoln, 1994). In addition, my research is also rooted in a critical paradigm because it aims to “not only understand the social world, but to change it” (Dejaeghere et al., 2020, S. 12) which further corresponds with the goal of emancipatory ESE (Wals, 2011).

I approached my research with the epistemological assumption that it is possible to learn about the needs of different individuals through interaction with them and the resulting generation and interpretation of qualitative data such as interview data or written, (self-) reflexive accounts. This has been criticised on the grounds that individuals are unable to access their inner worlds (see Walach, 2020) or that they have certain biases or deficits in doing so (Silverman, 2017). However, according to recent empirical findings from sustainability research, it seems plausible that individuals are very much able to access at least certain areas of their inner worlds (Frank & Stanzus, 2019; Wamsler, 2020).

In line with the questions regarding the relationship between time, sustainability and ESE raised in Chapter 2, as well as the methodological considerations mentioned, the research follows an exploratory approach. It was designed in a way to allow for methodological, data and researcher triangulation as a strategy to add “rigour, breath complexity, richness, and depth” (Denzin, 2012, S. 208) to the research (Flick, 2014). Thus, each of the studies has an individual methodological design which was chosen to cater to the open and exploratory nature of the research while adhering to the standards of qualitative social research (Alvesson & Skjöldberg, 2018; Denzin & Lincoln, 1994). Each study aimed at gathering data through a different set of methods, including reflective reports, interviews and survey data (see Table 3 for an overview of the individual studies’ methodological design). Finally, each of the studies was conducted by a research team, enabling ongoing processes of reflection and, thus, the achievement of consensus on the results (Wasser & Bresler, 1996). Figure 2 shows the research framework relating to the research questions, empirical studies, methodological approaches, and papers related to each of the four studies.

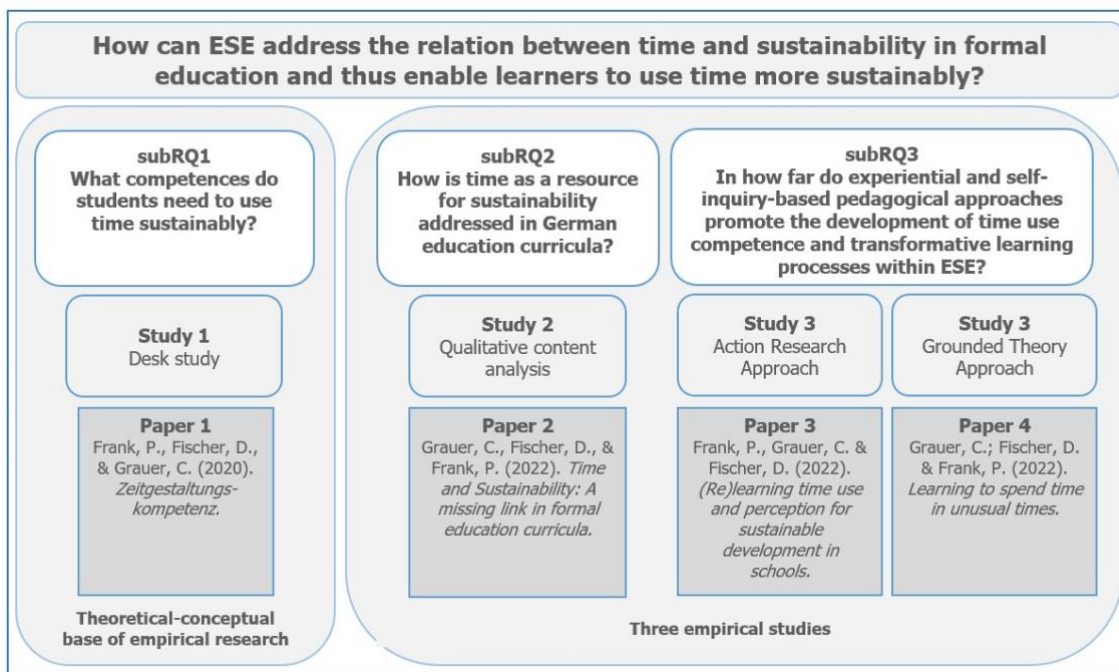


Figure 2: Research framework conducted in chronological order from left to right

In the first step, a learning outcome suitable for the goal of introducing time as a dimension of sustainability in pedagogical settings was defined to respond to sub-RQ1 *What competences do students need to use time sustainably?* The resulting definition of

the concept of time use competence presented in Paper 1 then informed the three subsequent empirical studies.

The first empirical study (study 2, reported in Paper 2) aimed at answering subRQ 2: *How is time treated as a resource for sustainability in German educational curricula?* It empirically examined the hypothesis admissible from section 2.1.3, according to which this topic has so far only rarely been dealt with in German schools. It used a qualitative content analysis approach to gather evidence about whether and in how far German curricula contain passages about time in relation to sustainability.

Studies 1 and 2 provided important groundwork for the studies 3 and 4. These both sought to answer sub-RQ3: *In how far do experiential and self-inquiry-based pedagogical approaches promote the development of time use competence and transformative learning processes within ESE?*

Study 3 (Paper 3) is an exploratory study inquiring into fostering the pedagogical goal of time use competence may be fostered by the pedagogical approach of SIBL. The study used an Action Research Approach, empirically testing, adapting, and evaluating a school-based intervention. It was chosen because it allows for continuous reflection and adaptation of the curriculum and the facilitation approach we chose through constant feedback loops between facilitators and participants. Next to aiming at generating insights into the suitability of the SIBL approach, the study also sought to contribute evidence which the participating schools might use to expand their curricula and for their respective school development processes.

Study 4 (Paper 4) inquired into students' time use experiences during school closures in the context of the COVID-19 pandemic. Since study 3 had to be suspended following school closures, study 4 was not part of the original research design. Yet, it provided the unique opportunity to compare students' experiences as participants of a pre-planned school intervention as reported in Paper 3 versus the involuntary real-life experiment of school closures. The study followed a Grounded Theory approach, allowing an exploration of students' experiencing time use during the COVID-19 crisis as it was unfolding. It also granted the necessary open-mindedness to inquire into this new phenomenon while guiding the research with its principles of theoretical sampling and sound data analysis (Corbin & Strauss, 2015).

Table 3 offers a short overview of the methodological designs of each of the studies, which are presented in greater detail in the individual papers.

Table 3: Overview of empirical studies' methodological design

	Study 2 (Paper 2)	Study 3 (Paper 3)	Study 4 (Paper 4)
Research question	<i>How is time as a resource for sustainability addressed in German educational curricula?</i>	<i>In how far do experiential and self-inquiry-based pedagogical approaches promote the development of time use competence and transformative learning processes within ESE?</i>	
Research design	Desk study; content analysis (Mayring, 2015)	Action Research Approach (Salite, 2008; Tripp, 2005)	Grounded Theory Approach (Corbin & Strauss, 2015)
Research Type according to Dillon & Wals (2006)	Research as evidence Research as activism	Research as evidence Research as co-learning Research as activism	Research as evidence Research as co-learning Research as activism
Data collection	<ul style="list-style-type: none"> ▪ 2.149 German curricula of all school types 	<ul style="list-style-type: none"> ▪ Students' reflective reports ▪ Interview transcripts ▪ Evaluation reports ▪ Interim feedback ▪ Questionnaires 	<ul style="list-style-type: none"> ▪ Zoom interviews (interview transcripts) ▪ Additional media sources (blogs, podcasts, news reports)
Research participants	n/a	156 participants (Students aged 14-21)	69 participants (45 students, 14 teachers, 10 other resource persons)
Data analysis	<p>Qualitative content analysis (Gläser & Laudel, 2010; Mayring, 2015) consisting of</p> <ol style="list-style-type: none"> 1. lexical search procedure 2. two-step coding procedure consisting of inductive coding (Spichal, 2018) by individual researchers, followed by discussions within the research team and subsequent second round of coding by two independent coders 	<p>Combination of conventional and qualitative content analysis (Hsieh & Shannon, 2005) consisting of</p> <ol style="list-style-type: none"> 1. an inductive coding process followed by 2. a collaborative coding process <p>each embedded within ongoing discussions within the research team to reach consensus on outcomes (peer debriefing (Flick, 2007))</p>	<p>Two-stage coding process (Corbin & Strauss, 2015) including</p> <ol style="list-style-type: none"> 1. Line-by-line and open coding 2. Axial coding <p>each embedded within team-based interpretation procedure including external experts (Flick, 2007; Reichertz, 2013), followed by theoretical matching (Goldkuhl & Cronholm, 2010)</p>

To conclude this section, I want to return to the framework proposed by Dillon and Wals (2006) to relate the aims of the individual studies and thus point out the overarching contribution of my research regarding ESE. I will resume this in section 6.1 when reflecting on my research.

This dissertation combines the three representations of ESE in the following way: first, it reflects *research as evidence* because of the particular research approaches and methods used in each study, which follow established standards and procedures of qualitative research. I consider this vital for research aiming at contributing to existing research, as presented in Chapter 2. Second, the research contains elements of *research as co-learning*. Thus, the choice of taking on the roles as co-facilitator of the school-based intervention (study 2), and co-interviewer (study 3), was particularly beneficial in acquiring insights into students' experiences by sharing the field and being in direct contact with them. Finally, my research is also *research as activism* because of my commitment to the goals of an emancipatory ESE. Given the empirical findings on the relation between time and sustainability, and the potential for fostering a sense of individual needs in this context, the research sought to generate empirical insights to promote the concept of time use competence and its future application in educational settings.

4 Overview of the papers

If one has no time, one has also lost oneself. Distracted by the obligations of everyday activities, we are no longer aware of ourselves... Everything is done all at once, faster and faster, yet no personal balance or meaning can be found. This implies the loss of contact with one's own self. We also no longer feel "at home" with ourselves and find it difficult to persist in any given activity because we are available at every moment.

Marc Wittmann (2016, S. 117)

In this section, I summarise the four papers, which are part of this thesis by presenting the research focus and main findings of each of these. Full texts of the papers are part of this thesis and are found in Appendices 2 – 5.

Table 4: Overview of papers, including reference to Appendices

Paper 1	Frank, P., Fischer, D., & Grauer, C. (2020). <i>Zeitgestaltungskompetenz. Arbeitspapier im Projekt ReZeitKon.</i> Lüneburg: Leuphana Universität.	Appendix 2
Paper 2	Grauer, C., Fischer, D., & Frank, P. (2022). Time and sustainability: A missing link in formal education curricula. <i>The Journal of Environmental Education</i> 53(1), 22-41.	Appendix 3
Paper 3	Frank, P., Grauer, C. & Fischer, D. (2022). <i>(Re-)learning time use and perception for sustainable development in schools – Qualitative results from a self-inquiry based learning intervention.</i> [Manuscript under review in <i>Environmental Education Research</i>].	Appendix 4
Paper 4	Grauer, C.; Fischer, D. & Frank, P. (2022). <i>Learning to spend time in unusual times – A transformative learning perspective on how students spent their time during COVID-19</i> . [Manuscript under review in <i>International Review of Education</i>].	Appendix 5

In chronological order, the papers reflect the research program of fostering time use competence in ESE, beginning with the conceptual working paper on time use competence (Paper 1), proceeding with the results of a qualitative content analysis on the representation of time and sustainability in German formal education curricula (Paper 2). Papers 3 and 4 present the results of two empirical studies, each focusing on a different aspect of students' time use. At the end of this section, I have included an overview of the main details of each of the studies (see Table 4).

4.1 Zeitgestaltungskompetenz [time use competence]

This working paper was developed early in the research process to establish the conceptual grounds for the planned research. It comprised a point of reference for the empirical research and subsequent publications and served as an overall goal of the pedagogical intervention designed as part of study 3. It thus provides a conceptual answer to sub-RQ 1: *What competences do students need to use time sustainably?*

The definition of time use competence attempts to bring together previously existing definitions of time use competence with the vision of sustainability, with a focus on needs-based approaches to sustainable consumption (Galak et al., 2013; Held, 2001). In line with previous discussions of competences for sustainability, time use competence needs to address the interplay of cognitive, bodily, emotional, and volitional skills (Freericks, 1996; Hatzelmann & Held, 2015). Furthermore, it does not focus on the individual alone, but acknowledges that individuals are always part of various structures of social time, requiring ongoing efforts of synchronisation and an awareness of other individuals' time-related needs. Following from this, time use competence is defined as

“the ability and willingness of the individual to spend their lifetime in a self-determined and self-responsible manner and to participate in shaping the social organization of time in such a way that their own need satisfaction and the need satisfaction of others living today and in the future are not jeopardized.” (Frank et al., 2020, S. 10)

Time use competence comprises three dimensions:

- (a) a personal dimension, understood as the individual's ability and willingness to spend his or her lifetime in a self-determined and self-responsible manner in such a way as to ensure the quality of their personal life,
- (b) an interpersonal dimension, which is the ability and willingness to consider the needs of one's immediate social environment in his life management and
- (c) a transpersonal dimension, defined as the ability and willingness to consider the collective needs of present and future generations in one's own use of time.

Fostering time use competence seeks to enhance individuals' engagement with their subjective experience of time, thereby enabling them to better align their time use with the principles of sustainability and a good quality of life. By engaging with their time-related needs and satisfaction of these, fostering time use competence might help individuals to engage in alternative, potentially more sustainable ways of consuming (Reisch, 2015; Rinderspacher, 2019). Defined as such, the concept presents an ideal state, which cannot be taught or learned over the course of one single educational intervention. Rather, it is more a matter of a lifetime, and an ideal to strive towards.

4.2 Time and sustainability: A missing link in formal education curricula

This paper first establishes a theoretical perspective on time as a resource for sustainability by summarising recent evidence showing the relation between individual time use and potentially negative outcomes for the environment (Jalas, 2012; Rau, 2015; Schor, 2005). So far, time as a dimension of sustainability is only rarely addressed in both ESE and formal education. Yet, formal education institutions are spaces where learners are confronted with societal norms and practices related to time, mostly without questioning them (Bunn et al., 2019; Duncheon & Tierney, 2013). The study thus focused on the following research questions:

- (1) To what extent is time as a resource for sustainability addressed in German state school curricula in different school types and subjects?
- (2) With which meanings is time as a resource for sustainability addressed in German state school curricula, and what connections are made between time and consumption?

Based on an analysis of 2,149 German state school curricula, we arrived at the following results:

- Most references to time stem from ethics, philosophy, religious education, and social sciences curricula, while references overall are sparse and mostly contained within secondary curricula.
- Compared to general education curricula, vocational education curricula mostly contain references to “time management” but only rarely contain reflexive perspectives on time.
- When there are connections drawn between time and sustainability, it most often refers to students’ leisure. What’s more, consumption is also almost exclusively addressed as being part of students’ leisure activities.

Overall, curricula therefore seem to further reify dominant approaches to time, rather than enable students to approach alternative concepts of time. They only contain a few references relating to time use and sustainability. This is especially relevant regarding sustainable consumption, which seems to be mostly addressed as a topic of individual leisure, instead of a more comprehensive topic affecting all areas of students’ lives.

Based on our findings, we suggest the following implications and recommendations: The focus on school as a social space where students are spending a considerable amount of their time, and where actions and decisions related to consumption are occurring daily, might be intensified. This regards both curricula and school development processes related to ESE: Time as a resource for sustainability seems to fit well to Whole Institution Approaches to Sustainability (WIA) (Holst, 2022; Mathar, 2015)¹⁹. Moreover, curricula might address the relation between time and sustainability more prominently and across all subjects.

¹⁹ As there is no uniform approach to WIA, I use the definition suggested by Holst (2022) based on a recent survey of core approaches to WIA in educational institutions “as continuous individual and institutional learning processes to coherently mainstream sustainability as a fundamental principle within all activities of an educational organization” (synthesis section).

4.3 (Re-)Learning time use and perception for sustainable development in schools

Based on the conceptual work of Paper 1 and the results shown in Paper 2, we developed a curriculum aiming at fostering time use competence, which we implemented with three partner schools, guided by the following research questions:

- (1) In how far do students struggle with their time and to what extent is time use competence hence something that is useful for their lives?
- (2) How do school students experience an intervention targeted at fostering time use competence?
- (3) What are the limitations of such an intervention regarding its aim to stimulate time use competence?
- (4) What are the challenges of applying the intervention, and what are extracurricular factors influencing the conduct of the intervention?

We used an Action Research approach (Newton & Burgess, 2016; Tripp, 2005) which allowed for constant reflection, adaptation and improvement of the intervention while it was implemented. Built around the pedagogical approach of SIBL (Frank & Stanzus, 2019) it was carried out with one cohort per school per semester for roughly 24 hours per school per semester. At its core were students' individual transformational projects on time use, embedded in a curriculum of regular mindfulness exercises and brief theoretical inputs regarding the concepts of time, needs, values, and consumption. We also included brief inputs to a basic understanding of research, aiming at students' ability to critically reflect on their progress during the semester.

The core findings indicate that school is a main cause of stress in students' lives. Leisure, too, was sometimes a source of stress, for instance, when students would have time-intensive hobbies such as competitive team sports or music practice. This is illustrated by students' transformational time use projects: the two most frequently chosen projects revolved around establishing routines for homework and reducing procrastination, and introducing a more regular sleeping rhythm, thus aimed at increasing individual well-being. A considerable number of students temporarily reduced activities associated with negative consequences for the environment (e.g., using electronic media) by replacing them with environmentally friendly alternatives (e.g. spend time outdoors), or activities increasing their well-being (e.g. regular exercise). The findings can thus be considered evidence to support the hypothesis that fostering time use competence can indeed contribute to increased personal well-being and need satisfaction through more sustainable consumption choices (Galak et al. 2011, 2013; Reheis, 2006; Reisch, 2015), although more research is necessary to further support this claim.

The intervention faced several limitations. One being that a minority of students reported being dissatisfied with the intervention, which we interpreted as a result of students' being irritated or alienated by the unfamiliar pedagogical format of experiential learning. Overall, however, the results of this exploratory study indicate that the pedagogical intervention on time use competence using the SIBL approach is promising for fostering time use competence because it holds the potential of increasing personal well-being while contributing to potential reductions in unsustainable consumption practices.

4.4 Learning to use time in unusual times

This paper presents the results from an exploratory study on students' time use and potential learnings regarding sustainable consumption, which we began in April 2020, soon after German schools closed because of the COVID-19 pandemic. We conceived of the pandemic-induced school closures as an involuntary time-use experiment. By this, we sought to gain insights into potentials of students' time use-related learning experiences for ESE and sustainable consumption. Our perspective thus differs from most recent educational science studies of school closures, which are characterised by a deficit-oriented view, that mostly seems to focus on students' learning loss. The study used a Grounded Theory approach, guided by the following research questions:

- (1) How did students experience school closures during the COVID-19 pandemic?
- (2) What contextual factors contributed to these experiences, and what transformative learning processes related to time use and sustainable consumption can be identified in them?

Based on interviews with 69 participants, including 45 secondary school students via Zoom between April 2020 and April 2021, we arrived at the following results:

- Students gained manifold learning experiences, which we grouped into three categories: (1) gaining increased awareness of time-related needs, (2) creating alternative ways of needs satisfaction and time use, and (3) undergoing perspective transformation.
- Students' experiences were influenced by several contextual factors either enabling or inhibiting learning experiences: (i) students' individual dispositions, (ii) family and living conditions, (iii) access to digital learning infrastructure, (iv) teacher support and feedback, (v) school as a social space, and (vi) schools' emphasis on qualification function.

Although the results indicate many learning experiences, students' themselves often seemed to remain in a state of anxiety, or fear of missing exam-relevant content. We interpret this as being related to schools' over-emphasis of the qualification function while neglecting the other two functions of socialisation and subjectification (Biesta, 2009, 2020). This primary focus on their qualification function likely is one reason for the ongoing emphasis on the dangers of learning loss (Engzell et al., 2021), and a related neglect on encouraging students through appreciating their overall handling of the disruptive situation.

Next to focusing on students' learning deficits, many schools also did not seem to sufficiently provide the support students would have needed during remote learning. As a result, many young people felt isolated and disconnected from their peers. From the perspective of transformative learning it thus appears that schools could not provide "safe-enough learning spaces" (Singer-Brodowski et al., 2022) which are considered an essential contextual factor enabling students' transformational experiences (Mälkki & Green, 2016). We thus suggest that schools might need to create this kind of learning space by placing a special focus on improving learners' abilities to handle uncertainty. Since it cannot be ruled out that future crisis might again bring about disruptions as severe as those caused by the COVID-19 pandemic, schools will need to develop responses on how to better prepare students to handle these in the future.

In addition, our study shows the potential of students' every-day experiences during the pandemic for future ESC. Despite the variety of experiences, all students share the collective experience of having had to adjust their time use and consumptive behaviour during the pandemic and thus having acquired insights into individual needs and experience with temporarily adjusting individual consumption. Recent research on individual consumption during the pandemic (Beasy & Gonzalez, 2021; Hoolohan et al., 2022) suggests that these temporary changes do indeed have the potential to lead to future sustainability transformations when embedded in a set of accompanying pedagogical and policy measures.

In sum, this study highlights the importance of schools in qualifying young people not only for their roles as future professionals but also as subjects being able to handle existing societal challenges such as the "wicked problems" (Engler et al., 2021) related to the global climate and sustainability crisis. Our study is therefore relevant to both ESE and general education research and practice, as we believe that multiple lines of connection can be drawn from students' experiences during the pandemic to ESE's concern with helping learners cope with sustainability-related crises.

Table 5: Detailed overview of the research papers

	Paper 1	Paper 2	Paper 3	Paper 4
Title	<i>Zeitgestaltungskompetenz</i>	<i>Time and sustainability: A missing link in formal education curricula</i>	<i>(Re-)learning time use and perception for sustainable development in schools – Qualitative results from a self-inquiry-based learning intervention</i>	<i>Learning to spend time in unusual times – A transformative learning perspective on how students spent their time during COVID-19</i>
Authors	Frank, P., Fischer, D., & Grauer	Grauer, C., Fischer, D., & Frank, P	Frank, P., Grauer, C. & Fischer, D	Grauer, C.; Fischer, D. & Frank, P
Publication status	Working paper, published via ReZeitKon project website	Published in <i>The Journal of Environmental Education</i>	Manuscript under review	Manuscript submitted for publication
Research questions	How can existing definitions of time use competence be supplemented with the dimension of sustainability?	<ul style="list-style-type: none"> ▪ To what extent is time as a resource for sustainability addressed in German state school curricula in different school types and subjects? ▪ With which meanings is time as a resource for sustainability addressed in German state school curricula, and what connections are made between time and consumption? 	<p>(3) In how far do students struggle with their time use and to what extent is time use competence hence something that is useful for their lives?</p> <p>(4) How do school students experience a self-inquiry-based learning intervention targeted at fostering time use competence?</p> <p>(5) What are the limitations of such an intervention regarding its aim to stimulate time use competence?</p> <p>(6) What are the challenges of applying the intervention, and what are extracurricular factors influencing the conduct of the intervention?</p>	<p>(7) How did students experience school closures during the COVID-19 pandemic?</p> <p>(8) What contextual factors contributed to these experiences, and what transformative learning processes related to time use and sustainable consumption can be identified in them?</p>
Addresses RQs	Sub-RQ1: What competences do students need to use time sustainably?	Sub-RQ2: How is time as a resource for sustainability addressed in German education curricula?	Sub-RQ3: In how far do experiential and self-inquiry-based pedagogical approaches promote the development of time use competence and transformative learning processes within ESE?	
Research Approach	Conceptual	Empirical	Empirical	Empirical

	Paper 1	Paper 2	Paper 3	Paper 4
Methodology	Literature review, conceptual definition	Qualitative content analysis	School-based intervention study; Action research approach	Interview study; Grounded Theory approach
Key findings	<p>Definition of time use competence as <i>“the ability and willingness of the individual to spend their lifetime in a self-determined and self-responsible manner and to participate in shaping the social organization of time in such a way that their own need satisfaction and the need satisfaction of others living today and in the future are not jeopardized.”</i> (Frank et al., 2020, S. 10)</p>	<ul style="list-style-type: none"> Time as related to sustainability in general education curricula is mostly approached from a reflexive point of view (religious education, philosophy and social science) Vocational education curricula mostly contain references to ‘time management’ Time and sustainability are mostly discussed in relation to leisure and consumption is almost exclusively presented as part of leisure sphere 	<ul style="list-style-type: none"> School and related tasks are a main cause of stress for students Self-chosen transformational projects are suited to foster learners’ insights into their time-related needs Students’ transformational projects often contained a change of practices towards more environmentally friendly ones 	<p>During school closures, students underwent the following learning experiences:</p> <ul style="list-style-type: none"> Acquiring increased awareness of time-related needs Creating alternative ways of needs satisfaction and time use Undergoing perspective transformation Schools seemed to focus on their qualification function, thus likely interfering with students’ transformative learning processes
Implications for the dissertation	<p>Outline of one core concept, which influenced the research design of studies 2-4 and which is suggested as a pedagogical goal of educational interventions targeting time as a dimension of sustainability</p>	<ul style="list-style-type: none"> Informed further empirical work Confirmed the hypothesis that time and sustainability are not frequently discussed in formal education 	<ul style="list-style-type: none"> Allowed for testing and adapting the curriculum developed in preparation for study 3 and thus a practical application of the concept of time use competence Identified topical areas relevant for students in the context of time use and sustainability 	<ul style="list-style-type: none"> Allowed for a comparison between the school-based, planned intervention and the “real time” experiment of remote learning during COVID-19 Allowed for further collecting evidence on students’ needs and experiences related to time use and sustainability
Scientific contributions	<p>The concept of time use competence expands existing concepts of time (use) competence with the vision of sustainability</p>	<ul style="list-style-type: none"> Provides empirical evidence for how little time and sustainability are discussed in formal education curricula The first study of this kind Thus provides context for studies 3 and 4 as well as future ESE research focusing on time and sustainability 	<ul style="list-style-type: none"> Contributes empirical evidence showing the SIBL approach is a suitable approach for fostering time use competence in education settings Shows potentials and tensions when implementing a time use competence intervention within formal education contexts 	<ul style="list-style-type: none"> Contributes a life-world perspective on students’ experiences during COVID-19, thus adding to existing educational research literature Contributes evidence on students’ individual time-use experiences during the pandemic and thus enriching the understanding of opportunities, challenges and obstacles young people faced during this period

5 Synthesis and discussion: How can we learn time in ESE?

And time is a dictator, as we know it. Where does it go? What does it do? Most of all, is it alive? Is it a thing that we cannot touch and is it alive? And then, one day, you look in the mirror — you're old — and you say, "Where does the time go?"

Nina Simone (ermanotube, 2009, S. 1:36)

Following the summary of the individual papers, the aim of this section is to synthesise the overall findings and to highlight the contribution of my research to ESE research. It was guided by the research question: *How can ESE address the relation between time and sustainability in formal education and thus enable learners to use time more sustainably?* Bearing this question in mind, I will first discuss my findings guided by three theses, each of which relating a different aspect of my findings to relevant literature. Next, I will present the main implications of my work for practical ESE before closing the section with an outlook for future research.

5.1 Three theses on time as a resource for sustainability following from the research

- (1) The research adds evidence to the hypothesis that there is a relation between individual time use and sustainable consumption and thus is suitable to inform future ESE and ESC.
- (2) There is a mismatch between the approach to time in formal education and learners' time-related needs, which might limit individual learners' development of time use competence.
- (3) Regarding education post-COVID-19, the time use competence lens is a chance to foster transformative learning in formal education.

(1) The research adds evidence to the hypothesis that there is a relation between individual time use and sustainable consumption and thus is suitable to inform future ESE and ESC

My research provides further evidence supporting the hypothesis that there is a link between individual time use and sustainability (Druckman & Gatersleben, 2019; Rau, 2015; Reisch, 2001; Southerton, 2020). While study 2 suggests that formal education curricula rarely address this link, studies 3 and 4 offer additional insights into the specific challenges students experience in relation to time and their schooling. They also provide evidence-based suggestions how ESE might approach students' use of time in relation to sustainable consumption. In particular, the perspective of linking time use and sustainability with current research on needs-based consumption and sustainability (Di Giulio & Defila, 2019; Fuchs et al., 2021) proved valuable. My work thus contributes evidence to the growing body of research on the potential of fostering intrapersonal competencies for sustainability.

As the literature shows, reducing time scarcity alone will not necessarily lead to more sustainable behaviour. Instead, it is important to take into account that time use is socially embedded, thus causing various demands for social synchronisation among individuals

(Southerton, 2020). At the same time, time use is related to individuals' mind-sets, which is relevant for sustainability (Lindsay et al., 2020). My findings further confirm these findings and show that a pedagogical approach aimed at fostering time use competence has the potential to address these issues. Studies 3 and 4 demonstrated that, under the conditions studied, students changed their time use in such a way that it led to more sustainable consumption behaviour. Yet, this seemed mainly motivated by students' interest in increasing individual well-being rather than because of a commitment to sustainability. However, consumption research has found that there is indeed a connection between well-being and sustainability (Geiger et al., 2021; Kasser & Sheldon, 2009). Accordingly, promoting time use competence through pedagogical approaches that focus on intrapersonal competences for sustainability and aim to promote learners' awareness of their time-related needs appears to be an appropriate approach.

More research is needed to better understand the links between time use, well-being, and sustainability. The results of my research suggest, however, that fostering time use competence through SIBL seems to be indeed suitable for an emancipatory ESE. Its potential lies in its aim at enabling individual learners to better understand their inner worlds, which, according to Ives et al. (2020), is still an under-represented perspective in sustainability research and practice. Ives et al. argue that an increased focus on individuals' values, emotions, and needs is needed to enable them to develop an attitude and mind-set enabling them to take part in the sustainability transformation. This relates the research on time use competence to the goals of emancipatory, transformative ESE. Selby (2015; 2018), for instance, has pointed out the interrelation between individual needs and how their realisation or suppression are related to structural and systemic causes of unsustainability. Moreover, Wals (2011) emphasises that transformative learning is about noticing and learning from others. The transformative element of a pedagogy of time use competence thus stems from insights into individual needs and relationship to the needs of others and the resulting ability of using one's own time while being aware of others' time-related needs.

Here, I would like to add that, although the findings confirm the potential for time use competence for ESE, the research did not include a longitudinal study design. It thus remains an open question whether and in how far a pedagogical intervention will have any long-term implications. Likewise, it is unclear which kinds of longer-term effects students' learning experiences regarding time and consumption during school closures might have. In fact, recent findings from research inquiring into sustainable consumption during the pandemic, suggests that temporary changes in behaviour will probably revert back to an established pattern in the long term (Gordon-Wilson, 2021; Hoolohan et al., 2022; Hüttel & Balderjahn, 2022).

At the same time, all authors point out the relevance of evidence regarding temporary behavioural changes regarding future policy development and the design of future educational activities. Hoolohan et al., (2022), for instance, suggest that the fact that virtually all consumers had to change their practices of food preparation and consumption during the pandemic now provides a rich reservoir of experiences which to tap for future interventions on sustainability and food. Similarly, the fact that all students (and their teachers) experienced changes in time use and individual consequences for individual behaviour may be considered of equally rich potential for ESE to work with.

Another example is Beasy and Gonzalez' (2021) research on Australian ESE practitioners who were motivated to permanently changing certain unsustainable consumption behaviours after initially having been forced because of pandemic restrictions. This suggests that behavioural changes towards more sustainable behaviour are more likely to occur when individuals have already engaged with sustainability-related issues. Beasy and Gonzales' findings are not transferable to German high school students. Yet, they are relevant in that they confirm that behavioural changes towards more sustainable behaviour seem to be more successful when individuals have already dealt with sustainability. Given the many pandemic-related behavioural changes identified in study 4 and in the literature cited in Paper 4, learners' experiences are a powerful reservoir with which ESE might tap. The empirical findings of this paper therefore suggest that including the perspective of time use competence could be an asset to ESE. Drawing on the time- and consumption-related experiences of students could further engage all learners, as a whole generation of students has experienced radical changes in their time-use routines.

Here, the everyday life perspective adopted in study 4 proves relevant for future ESE research and practice. In contrast to the prevailing narrative of learning loss (see Paper 4), it allows for a broader view of students' experiences and includes, for example, their newfound insights into their time and consumption needs in the category of learning experiences. Thus, the research contributes to research on intrapersonal skills and the importance of individuals' awareness of their inner world in terms of sustainability transformation (Wamsler, 2020). As mentioned earlier, such internal change cannot be considered in isolation from larger social and political contexts (O'Brien, 2018). Regarding the promotion of time use competence, future research could therefore particularly explore how this can be achieved within educational institutions, since, as mentioned above, the perspective on time as a scarce resource is predominant in these. This brings me to my second thesis.

(2) [There is a mismatch between the approach to time in formal education and learners' time-related needs, which might limit individual learners' development of time use competence](#)

The findings presented in this thesis contribute further evidence to research which found that school is a source of stress and exerts pressure on students. Studies 3 and 4 suggest that this stress partly stems from their inability to realise individual time-related needs. The results thus confirm earlier findings on how school and related tasks such as homework and studying for exams create feelings of stress and time pressure (Breidenstein, 2006; Cosma et al., 2020; Thing et al., 2015).

In addition, the results indicate that, when given the opportunity, students are able to use their time in a way that suits their own needs. This happened both during the intervention study (Paper 3) and during the school closures (Paper 4). Initially, students experienced an abrupt loss of school time structures, which they countered with remarkable creativity and initiative. The findings thus validate suggestions of those educational researchers who argue that school instruction should pay more attention to the process-oriented nature of learning and, on the unique time-related needs of each student. The research thus adds a student perspective on what Gravesen and Ringskou (2017) have described (from the teachers' point of view) as "timeagogy" (ibid., p. 164). In section 2.2, I mentioned how this is considered a result of an outcome-based approach to learning

which is related to time-bound measurement, such as end-of-year exams (Buddeberg & Hornberg, 2017; Compton-Lilly, 2016).

Here, study 4 is offering insights into what happens if the institutional framework is disrupted, as happened during pandemic-induced school closures. Although students still described feeling stress and anxiety, they also reported feeling comfortable being able to better align their individual time-related needs while being at home and participating in remote learning. This is in line with Alhadeff-Jones' (2019) observation that learning is an individual process, and therefore in conflict with the approach to time that is common to most schools. Alhadeff-Jones, with a background in transformative learning, suggests conceiving of learning as cyclical rather than linear because it involves different pacing and tempo, and a change between individual and interpersonal reflection and dialogue. My findings also tie in with Beljan's observation that students often are denied the opportunity to make qualitative experiences of time in school (Beljan, 2018). Beljan bases his argument on Rosa's resonance theory²⁰ (Rosa, 2019), according to which realising one's own time-related needs is necessary, especially in the context of school. In this way, Beljan argues, students can experience that and how time can be used differently and is not only primarily an economic resource that can be used efficiently and actively experienced. Summing up, the concept of time use competence proposed as part of this thesis responds to these suggestions by extending the qualitative perspective on the relation between well-being and sustainability.

In line with the finding that the approach to time use competence has the potential to contribute to more sustainable behaviour, the question remains how exactly educational institutions can now implement this, given the urgency of the global climate and sustainability crisis. Study 2 demonstrates that contemporary German curricula to date are mostly conveying an approach to time which emphasised time as an objective unit of measurement and a scarce economic resource. However, evidence on time use and its relationship to individual well-being and sustainability presented above suggests that this would need to change to enable learners to manage time in a more time-competent and thus sustainable way.

One suggestion is thus to increase students' autonomy over their time. According to study 4, one cause of students' stress and anxiety during school closures was their inability to organise themselves, coupled with a lack of support from many schools. In a study with students in vocational training, Dornbach (2014b) comes to similar conclusions. He criticises what he sees as an overly narrow view of time management within the institution studied. He argues that because students' time is managed for them it hinders their ability to independently use their time. This, in turn, no longer meets the demands of today's working life:

"This paradox is also partly responsible for the deficits in the observance of meaningful break times among many employees, which is often lamented in time management literature. In view of the externally determined learning and working

²⁰ Resonance theory, developed by Hartmut Rosa, considers it important that an individual relates to its environment through resonance (Rosa, 2019). Rosa defines resonance as "a kind of relationship to the world formed through affect and emotion, intrinsic interest, and perceived self-efficacy in which subject and world are mutually transformed" (ibid., p. 177). Rosa argues that today's human beings are often unable to experience resonance, which is partly due to the current processes of acceleration and efficiency. These prevent pausing and experiencing one's own needs as well as the ability to engage with the environment.

rhythms in school and training, [employees] are simply often not sufficiently prepared for self-determined scheduling of break times.” (Dornbach, 2014b, S. 129)

Indeed, this is further supported by findings from a sociological study of European professionals who reported they were only partially able to meet the demands of an accelerated society (Schöneck, 2018), resulting in reduced levels of well-being. According to the established relation between time use, well-being, and sustainability, promoting time use competence in schools might thus indeed benefit students in their capacity as future members of the workforce, too.

In fact, there are indeed corresponding pedagogical concepts already implemented within Germany and in other countries. There are, for example, alternative schools such as democratic schools (Aquarone, 2021; Dornbach, 2014b). These, among other principles, are characterised by not having fixed time structures such as timetables, for instance, the well-known Summerhill School (Stronach & Piper, 2009). Another example is Maria Montessori’s pedagogical approach, which provides time freedom during which pupils should learn without time pressure (Schumacher, 2020)²¹. Furthermore, many state schools, too, are already implementing approaches aiming at breaking up traditional time structures. These are, for instance, approaches to self-organised learning (see section 2.2.3) or models in which students have a say in the organisation of their timetable (McVeety & Farren, 2019). Critics, however, emphasise that these existing approaches often are only applied punctually, and that it would need a more comprehensive approach to changing the overall approach to understanding time in educational institutions (Beljan, 2018; Reheis, 2007). Thus, future research might address the question of how time-related needs of students, but also other actors within schools, can be better addressed. For practitioners, the concept of time use competence further offers the possibility to expand existing pedagogical approaches to time management with the aspect of sustainability.

(3) Regarding education post-COVID-19, the time use competence lens is a chance to foster transformative learning in formal education.

Study 4 is one of the few empirical studies to date that explicitly focuses on young people’s learning experiences beyond academic proficiency during the pandemic. It thus shows which kinds of resources young people could mobilise in a time of crisis. The study thus provides a counter-narrative to the portrayal of the pandemic as a time of academic decline in student achievement that seems to prevail in both educational policy and research (see Paper 4 for references). There is indeed ample evidence of negative effects of school closures, which include notably negative effects on students’ psychological and physical well-being, besides academic deficits. However, Paper 4 offers an additional perspective on how there seems to be potential to give more credit

²¹ I am aware that this brief overview is anecdotal and incomplete, as there are a multitude of free or reform school forms, which often share at least a few characteristics, but also have individual theoretical and historical roots (Barz, 2018). Instead of giving a comprehensive overview, however, my intention here is pointing out that there are already several pedagogical approaches and concepts in which time is practised differently than in most mainstream schools and which thus provide various points of contact for the concept of time use competence in pedagogical settings.

to students' individual learning experiences in terms of time use and needs satisfaction and to build on these for future educational research and practice.

When asked what they expect from school in the future, many of the respondents in study 4 stated that schools should better prepare them for future crises. The promotion of a time use competence as piloted in this work therefore seems relevant considering this demand. This connects to the frameworks for key competences for sustainability in which the ability to handle uncertainty is often an important element (Gardiner & Rieckmann, 2015; Tauritz, 2019). The results of my research thus contribute to existing frameworks by adding a time use competence perspective to the notion of time inherent in existing frameworks. Study 4 showed that students' lack of ability to shape their time autonomously was a contributing factor to their struggles during the crisis. A time-shaping competence that enables learners to recognise their time-related needs and consciously shape their behaviour accordingly could thus be a complementary approach to handling uncertainty.

Through relating time and sustainability, ESE has thus much to offer for formal education regarding the preparation of learners for future crises. ESE scholars have emphasised this throughout the ongoing pandemic, pointing out that the pandemic needs to be addressed as part of the global climate and sustainability crisis (Bai, 2020; Wolff, 2020). Others raised the concern that an education policy post-COVID runs the danger of overlooking the efforts made during the previous years to embed ESE more firmly in schools. Instead of focusing only on core subjects, as happened in Germany at the height of the crisis, Nina Kollek, for instance, argues that the pandemic offers a unique opportunity for school education to provide learners with a global perspective on crises (2020).

The empirical findings of my research complement this by showing that learners may benefit from developing an awareness of their inner values and corresponding needs in addition to factual knowledge. Hence, the concept of time use competence proves one possibility to pedagogically address this. While there are various entry points for a focus on students' time use, young peoples' experiences during the pandemic, as studied in Paper 4, seem especially useful as a point of departure. Since all young people have direct experience of coping with the crisis, pedagogical interventions may begin with addressing and reflecting similarities and differences in their experiences. This might, for instance, happen through different pedagogical formats, of which there are many in ESE (Backman et al., 2019; Kopnina, 2020). Bringing in a time use competence perspective would then add a stronger focus on how individual time needs are linked to structural and institutional demands, such as students' limited time autonomy. Next to singular pedagogical interventions, the time use perspective seems suitable for enriching WIA (Hargreaves, 2008; Mogren & Gericke, 2017), which are already established in school development in many countries (Mathar, 2015). The perspective of time use competence lends itself as a complement to this because it aims to reconcile individual time-related needs with collective needs as well as the specific institutional framework conditions.

This is further supported by findings whereby the acquisition or development of time use competence should be understood and approached as a longer-term process that is unlikely to be sufficiently achieved by a single intervention (Olsson et al., 2022). Therefore, there is a risk that changes in students' routines set in motion by a single school-based intervention, such as the one tested in study 3, might not be permanent

unless the specific time-related contextual conditions and practices change. As shown in study 3, school-related stress was a major reason individual participants did not follow up on their transformational projects or did so only irregularly. In addition, study 4 raises attention to how temporary changes in students' daily routines were reversed once schools reopened and students returned to their pre-pandemic routines. Therefore, to facilitate longer-term changes of time use and to promote time use competence, it is probably necessary to do so over a longer period.

I have already hinted at some implications for ESE practice in the preceding paragraphs. I will now continue by presenting the main implications for ESE practice stemming from my research.

5.2 Implications for ESE practice

UNESCO in its *Roadmap* for ESE for 2030 calls for education policy and practice worldwide to step up their efforts in implementing ESE at all levels. This is to be done in a way which includes a “narrow focus on topical issues rather than with a holistic approach on learning content, pedagogy, and learning outcomes to bring about the fundamental behavioural shift to sustainable development” (United Nations Educational Scientific and Cultural Organization (UNESCO), 2020b, S. 9). To make my recommendations relatable to this global strategy, the following section contains points of entry for each of the five priority areas identified by UNESCO.

To promote time use competence as a topic of transformative ESE, I see leverage points on the following three levels:

- Micro level: targeting individual learners through pedagogical interventions and approaches
- Meso level: time use competence as an addition to WIA and school development
- Macro level: consider time and sustainability as a relevant topic in ESE curricula and general curricula

Micro level: targeting individual learners through pedagogical interventions and approaches

First, promoting and implementing pedagogical approaches and learning interventions which promote time use competence or other transformative learning formats focusing on time and sustainability might be useful as short-term measures against the reported feelings of stress and time scarcity among students. Based on the findings where there are interdependencies between time wealth, well-being and sustainability, and the observation that time in formal educational settings is often approach to time as a scarce resource targeting individual learners may be a first step in tackling the complex topic of time. While this may not change structural conditions which often are at the bottom of these feelings, fostering learners' awareness of their inner worlds and thus their personal competences for sustainability appears to be an important step in their development of a broader set of key competences for sustainability.

Accordingly, the intervention introduced in Paper 3 might serve as a template for establishing such kinds of alternative approaches to learning how to use time more sustainably. For this reason, we have published a pedagogical toolkit for ESE

practitioners which contains a set of practical exercises (Grauer et al., 2021). By this, we sought to make our work accessible to teachers and other educational practitioners.

In addition, there are further pedagogical materials, such as Butler et al. (2012), who also suggest concrete learning activities for pedagogical intervention, albeit without the needs-based approach promoted in this dissertation. Another useful pedagogical intervention is the “Time Honoured” approach, as introduced by Campbell and Timmerman (2007) who propose adding a time dimension to the established place-based pedagogies of ESE (Balvanera et al., 2017). This includes learners’ engagement with the different time layers or dimension of the past, present and future in relation to the physical spaces of learning or living, as well as the understanding of the relevant natural and biological rhythms. An application of this approach may happen in various subjects. Moreover, it might be the subject of future research, by extending the time use competence approach piloted in study 2 with a more in-depth engagement with different aspects of time.

Furthermore, targeting individual learners is fully in line with *ESE for 2030* priority area 4 of *empowering and mobilising youth*. Fostering their understanding of individual time use and related needs and thus understand the relation between time use and sustainability as one aspect of the present climate and sustainability crisis can be an empowering experience. Considering the research on transformative ESE this requires “safe enough” (Singer-Brodowski et al., 2022) learning spaces which allow learners to explore their needs and emotions along with others within an environment acknowledging potential hurt and grief and acknowledging diverse experiences and opinions (Mälkki & Green, 2016). This is a matter addressed by the next sub-section.

Meso level: Time use competence as an addition to WIA and school development

Individual pedagogical approaches and interventions have the potential to resonate with learners in different ways, but also risk not having a longer-term impact (Olsson et al., 2022). Considering the findings on time in school from this dissertation, I therefore suggest that the concept of time use competence might serve as a valuable addition to the WIA to ESE. By linking the different levels of intra-, inter-, and transpersonal time use, it might complement school development with a perspective on time that explicitly relates time to sustainability. This would allow taking into consideration the different time-related needs of all stakeholders in a school environment. Besides the students, this includes the teachers, the school management, as well as the administrative and facility management staff.

In a first step of a WIA process including time use competence, it could be analysed, for example, which different time-related needs exist in the respective school. In line with transformative ESE, it is important to recognise that there are different needs and to share them. The second step might entail to what extent the findings can be reconciled with the existing school organisation. For example, some students and teachers we interviewed for study 4 said that they could imagine being able to complete certain assignments at home rather than at school, especially when schooling extended into the afternoon hours. Thus, schools might investigate more flexible time arrangements, also considering the specific experiences made during the pandemic with remote learning.

This might foster time use competence while also increase students' and teachers' well-being.²²

What's more, time use competence easily links to other cross-cutting issues currently relevant to school development, such as inclusion (Plows & Whitburn, 2017), diversity (Klein, 2014) or health and well-being (Simovska & Mannix-McNamara, 2015). As research on time and education shows, there are interdependencies between time use and students' socio-economic background and their individual personalities. Thus, it might be suitable to improve ongoing school development processes and provide links to existing policies such as *ESE for 2030* priority area 2, which explicitly addresses WIA as "transforming the learning environment". Furthermore, priority area 5 "Strengthening local communities" is relevant here, because although the WIA's primary focus is on the single school, it explicitly aims at linking school with its local community and thus contributes to sustainability transformations at the local level (Mogren, 2019). Including a time and sustainability perspective into WIA will thus always also relate to the wider community and locally established routines. This might, for instance, require aligning bus timetables with changed school timetables.

Macro level: consider time and sustainability as a relevant topic in ESE curricula and general curricula as well as in education policy

Study 2 shows that in German curricula, there are only a few references to time as a resource for sustainability. Instead, the perspective of time management prevails. In addition, aspects of sustainability are mostly associated with private leisure time instead of opening a broader societal view. Based on these findings, and responding to *ESE for 2030* priority area 1, "advancing policy", future education policy development might put a stronger focus on time and sustainability and its relation to how time is organised, taught, and learned in schools.

Although ESE content has been increasingly included in the regular revision of German curricula over the last decade, current studies still rate it as too little compared to the goals of international policies, such as the UNESCO Roadmap (Brock & Holst, 2022; von Seggern, 2019). Relating time and sustainability accordingly offers a wealth of topics and perspectives that are relevant in curricula of individual subjects and across subjects. As section 2.1 shows, in every subject area there are a multitude of differing perspectives on time, which I have grouped into the three categories 'objective', 'subjective' and 'biological'. Moreover, the suggestion of adding the approach of time use competence to the prevalent time management approach might not only contribute to implement ESE policies. It would also respond to the need of present and future employees to shape their time autonomously (Klaver & Lambrechts, 2021).

²² I am aware that this suggestion is somewhat generalizing and will not be immediately applicable in schools. At the same time, the German federal region of Saxony-Anhalt is presently piloting a scheme where secondary students are learning at home every Friday (Ministerium für Bildung des Landes Sachsen-Anhalt, 2022) while critics note that it is merely a disguised measure to address the persisting shortage of teachers (Wurzbacher, 2022). In view of the results of my research, it would therefore be even more important to include a time use competence perspective in school time organization. This complements the already criticized approach of time management and at the same time establishes a connection between time and individual well-being as well as the sustainability discussion.

Another implication is the suggestion to untie the achievement of competences from time-bound goals. As discussed in sections 2.1.3 and 2.2.2, many education researchers consider this one cause for continued experiences of stress and time scarcity among students and teachers alike. Educational approaches which focus on the individual learners' developmental process and their own rhythm and pacing are thus considered more conducive to transformative learning experiences (Alhadeff-Jones, 2019). I am aware that this proposal is rather simplistic and generalising. At the very least, however, the perspective of a time use competence could serve to ignite or support debates on the importance of learners' individual time needs and rhythms.

A third implication is the suggestion of adding time use competence to teacher training, which corresponds with *ESE for 2030* priority area 3 ("Building the capacity of educators"). Changing policies and curricula will probably not be successful if those who implement them do not receive proper training. Therefore, incorporating a time use competence perspective into teacher education could be fruitful. This is especially so because ESE's goals and values can only be credibly communicated if teachers themselves are convinced of them, as Kerry Shephard has noted (2022). For teachers themselves, developing time use competence might be beneficial, too, as many reportedly are suffering from time shortages and stress themselves (Gravesen & Ringskou, 2017; Weißenfels et al., 2022).

6 Critical Reflections

The generations are co-existing, the past is always in the present, and the future is always in the past. I am arguing here that time is neither irrefutably a forward moving measurement of space as represented by science, nor an ontologically neutral concept.

Christine Jill Winter (2020, S. 282–283)

Having presented the synthesis and the implications of my research, I now want to proceed with critical reflections of my dissertation. To do so, I will proceed in four steps. First, I will begin with a general reflection of the overall research approach, returning to the framework of Dillon and Wals (2006) introduced in Chapter 3. Second, I continue with an in-depth reflection of the research methodology. Third, I am going to reflect on my positionality researcher. Fourth, I will summarise the main general limitations of my research. I close this chapter with an outlook for future research.

6.1 General reflection of the research perspective

In Chapter 3, I introduced Dillon and Wals' (2006) framework of three representations of ESE research (see Table 2). As intended by the authors, I use it as an aid for critically reflecting on the ontological, epistemological, and axiological assumptions for ESE research, and thus an overall research perspective. Dillon and Wals emphasise the importance of attaining clarification about one's research perspective because

“the kinds of questions we ask, the purpose for asking them in the first place, how we ask them, to whom we ask them (and whom we exclude), how we value people's responses, how we relate to those who partake in a study, who is to benefit from the study, and so on, are worldview-laden” (2006, S. 552–553).

I therefore use this framework for a first, general reflection on my research. The three representations were: (1) research as evidence, (2) research as co-learning, and (3) research as activism. I have already mentioned that my research contains elements of each of these rather than falling into one category. This is because of its transdisciplinary nature and the resulting process of co-creation of knowledge with its immediate relevance for practical application in educational contexts (Barth & Michelsen, 2013).

First, my research is **research as evidence** because I considered it important to apply a methodological design which uses established qualitative methods and applies the standards of sound scientific practice (Dejaeghere et al., 2020; Flick, 2009). Even though the research is situated within ESE research and focused on time and sustainability within educational settings, its *locus of impact* is partly universal because it aims to spark a discussion of the meaning and use of time beyond educational settings.

Second, my research contains elements of **research as co-learning**. This was especially relevant during the encounters with students (as well as teachers and other resource persons we worked with). Facilitating the school-based intervention and interviewing students about their experiences during school closures during the pandemic happened in the researcher mode of *actively-detached* and *explicitly-biased*, aiming at both *improved understandings* of students' time-related experiences, but also an *increased (self)awareness* of my positionality as researcher and my position towards

the focus of my research. Throughout the research, I benefitted enormously from trying to understand students' perspectives, and constantly felt challenged in my own assumptions on time, education, and sustainability — the core concepts at the centre of my research. Here, I could make use of my research competences as *good listener and storyteller and interpreter* which were influenced by the modus of understanding of *hermeneutic-interpretive*, stemming from my conviction that students are “articulate commentators of their social world” (Meloni et al., 2015, S. 107). While I believe that individuals each perceive themselves and their environment in idiosyncratic ways, I am also convinced that it is possible to approach their interpretations of reality (Alvesson & Skjöldberg, 2018; Denzin, 1994) using a methodologically sound research approach and to draw robust conclusions from this for research.

Co-learning implies the meeting between individuals at eye-level. While I conceived of myself as a co-learner, I was, however, always in a position giving me more power and control over the situation than the research participants. This was clear during implementing study 3, which happened during regular school days and therefore in a formalised context, which meant students' participation was mandatory. And while I interpret the data in a way that participants underwent certain learning experiences regarding time use competence, it is not entirely clear in how far this can be attributed to my intention of approaching the research as co-learning.

Finally, my research has elements of **research as activism** because it was motivated by my conviction that there is a link between individual time-related practices and their impact on sustainability (see also section 2.1.2). The research is therefore influenced by a *socially critical* modus of understanding and an *actively committed* and *explicitly partisan* researcher role. Study 3, with its focus on the school-based intervention, sought to enhance students' awareness of the relation between their individual needs and their time use to enable them to base choices of time use on these insights. The results of study 4 are clearly in line with my research expertise as an advocate for research participants. I consider them relevant regarding possible reforms in school education in the wake of the COVID-19 pandemic, as it has been shown that students can benefit from a greater focus on their individual time-related needs. Here, I want to point out that while I approached my research as activism with the best intentions, I cannot rule out possible negative impacts. While I am convinced of the relevance of using the concept of time use competence in ESE practice, and while I interpret my findings in a way that it addresses issues experienced as difficult by students, it is possible that my research primarily served to promote my personal researcher agenda, rather than promoting the best interests of my students.

Summing up, the overall goal of the research was to make a hitherto only rarely explored topic more visible within ESE. This has the potential to broaden existing perspectives on time in education and thus contribute to promoting changes in established cultures of time in education, linking it to sustainability. From my perspective as an ESE educator-turned-researcher, it is my firm conviction that ESE is suited to enable learners to develop their own vision and position regarding sustainability, making no prescriptions of intended behavioural choices (Sterling, 2011; Vare & Scott, 2007). This emancipatory view of ESE has clearly guided my overall research. Thus, while all three types applied to the design of the research, it overall leans most towards the **research as activism** type because I consider it as contributing to and stimulating further research and practice on time use competence in transformative ESE.

6.2 Reflection of the research methodology

In this section, I want to reflect on the methodological approach and the resulting implications for my research. I am going to particularly consider the long-standing debate on the criteria for assessing the quality of qualitative research (see e.g. Alvesson & Skjöldberg, 2018; Denzin & Lincoln, 1994; Flick, 2009). There is an ongoing discussion on the usefulness of concepts such as validity and reliability because of their association with quantitative research and a positivist tradition (Flick, 2020). While some researchers argue against the use of these concepts (Lincoln & Guba, 1985; Tracy, 2010), others suggest adapting these categories for evaluating qualitative research (Dejaeghere et al., 2020). One such proposition is Tracy's (2010) eight "Big Tent" criteria for the evaluation of qualitative research. These are: (i) worthy topic, (ii) rich rigour, (iii) sincerity, (iv) credibility, (v) resonance, (vi) significant contribution, (vii) ethics, and (viii) meaningful coherence. The strength of this approach is that it considers the entire research process instead of singular steps.²³

In the following I am going to focus on the three criteria of *credibility*, *resonance*, and *ethics* because they relate to the criteria of validity and reliability that are considered important when discussing qualitative research (Dejaeghere et al., 2020; Flick, 2009). Regarding the other criteria, *sincerity* will be addressed in section 6.3, while the remaining ones have been addressed in different chapters and/or the single papers.²⁴

Credibility

Credibility refers to "trustworthiness, verisimilitude, and plausibility of the research findings" (Tracy, 2010, S. 842) and therefore corresponds approximately to the criterion of validity, yet adapted for doing research with a "human instrument" (ibid., p. 843). I consider this relevant because the main body of data for studies 3 and 4 comprises students' self-reports. These, like any data in qualitative research, "are the *results of interpretation*" (Alvesson & Skjöldberg, 2018, S. 11 emphasis in original), meaning that self-reports are already the products of subjects' interpretations of how they construct reality. Thus, they may only offer limited insights into students' experiences (Bassett et al., 2008; Silverman, 2017). Any encounter of the researcher with data is then an additional act of interpretation, because perception is filtered through the researchers' particular research approach (Alvesson & Skjöldberg, 2018). The methodological design of my research aimed at addressing the existence of blind spots (Wagner, 1993) and biases in the interpretations as far as possible. Although this is never entirely possible, two aspects of the research process were important in this regard: Triangulation of data (Denzin, 1989a) and the overall research setting as an "interpretive zone" (Wasser & Bresler, 1996).

First, **triangulation** is "an approach to further substantiate the knowledge gained with qualitative methods" (Flick, 2009, S. 445). It is considered a strategy involving the

²³ Flick (2020) critically remarks that Tracy's model lacks any specification on how much of each of the criteria must be met for research to adhere to qualitative quality criteria. He adds, however, that this is also an unresolved problem with other models for the assessment of qualitative research.

²⁴ The criterion of *worthy topic* has been addressed by Chapter 2 while Chapter 3 and the individual papers address matters of *rich rigour*. In addition, this framework overall seeks to address the criteria of *significant contribution* and *meaningful coherence*.

combination of various methods and perspectives to help researchers improve their understanding of subjects' representations of phenomena (Denzin, 2012), as with my research. The overall research design allowed several forms of triangulation, including triangulation of methods, of data, and of investigators (Denzin, 1989b; Flick, 2009). Studies 3 and 4, with their focus on acquiring insights into students' experiences related to time use in educational contexts, shall be mentioned here. The studies' different methodological approaches allowed for including groups of student participants who differed according to age, socio-economic background, and school type. In addition, we could gather various kinds of data through different methods, the latter including time logging, reflective assignments, and mid-term surveys. Data then included time logs, reflective reports, surveys data from study 3 and interview transcripts from study 4.

Second, I consider conducting the research within a team and thus an “**interpretive zone**” (Wasser & Bresler, 1996) a major strength. The interpretive zone is:

“the intellectual realm in which researchers work when they engage in collaborative work with each other [and where they] bring together their different kinds of knowledge, experience and beliefs to forge new meanings through the process of joint inquiry” (ibid., p. 13).

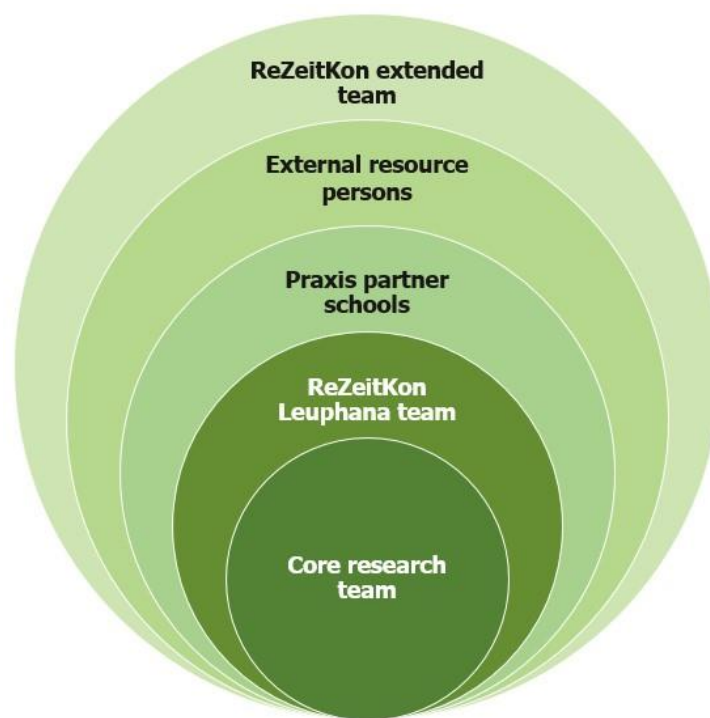


Figure 3: ReZeitKon as an interpretive zone

Figure 3 shows the different levels of my research's interpretive zone: First, there was the core research team, comprising me and my co-researcher Pascal Frank. On the second level, it extended to Daniel Fischer as the project leader of the Leuphana team, with whom we met regularly to discuss the progress of the project, the next steps and the first results. This also included our student assistants who supported us in all steps of the research and were important participants in our interpretation sessions. Third, there were the students and teachers of the partner schools with whom we met regularly during the duration of the intervention research. Next, we occasionally invited external

resource persons with expertise in educational research and practice for workshops or interpretation sessions to further validate our findings. Finally, there were the researchers from the other two sub-projects at TU Berlin and Fraunhofer ISI, with whom we met every regularly to share and discuss the project progress.

The concept of the interpretive zone serves to untangle the importance of discussion and communication throughout the research process. Being part of a research team during my dissertation research made me appreciate of how much I benefited from researching as part of a team. Especially when I contrast it to doing the research process for my master's thesis (Grauer, 2005), during which I worked as a "lone researcher" (Wasser & Bresler, 1996, S. 5).²⁵ Not only did I learn a lot from my colleagues in the process of research, but the constant process of sharing and critically reflecting on all steps of the research process meant a valuable gain for my research and for me as a person. For example, I found it highly beneficial to facilitate both the school intervention and the data collection for study 4 together with a male colleague. Because of the different insights our female respectively male socialisation gave us and because we each had differing former student biographies, I could uncover quite a few blind spots related to the data which I alone would likely never have realised.

That said, the research has also certain shortcomings regarding matters of credibility. One refers to its claim to transdisciplinarity. The research project ReZeitKon was designed as a transdisciplinary project and my research on time in formal education would not have been possible otherwise than through close cooperation with the practice partners. It remains to be critically noted here, however, that even though the praxis partners welcomed our research and expressed interest in introducing the findings into their future pedagogical and school development processes. At the same time, it is questionable to what extent they really represented equal research partners. Transdisciplinary sustainability research aims at initiating mutual learning processes between academic and non-academic partners (Kubisch et al., 2021). While teachers were always welcoming and interested in our work, and we could not have carried out our research without the participation of the students, it is possible that the research team may have had a far stronger investment in the overall project, stemming from funding obligations and personal interests including getting a PhD (see also Arnold, 2021).

Resonance

Resonance refers to "research's ability to meaningfully reverberate and affect an audience" (Tracy, 2010, S. 844) and thus to its transferability (Lincoln & Guba, 1985; Tracy, 2010).²⁶ Through focusing on time use competence from the perspective of individual students, I wanted to inquire into the specific challenges and individual needs

²⁵ Here I would like to add that, as Wasser and Bresler (1996) note, any research is a social process since it always happens in social contexts. Even the "lone researchers" are often associated with institutions, may relate to the research participants, and will communicate with colleagues and/or a wider audience at various stages during their research.

²⁶ I prefer the term transferability over the term generalisability as the latter has been criticised for leaning towards a positivist idea of generalisation through statistical representation (Tracy, 2010). Transferability instead responds to a representation of different points of view and thus the variation of particular phenomena or practices (Halkier, 2011; Larsson, 2009), indicating "a study's potential to be valuable across a variety of contexts or situations" (Tracy, 2010, S. 845), and thus aiming at enabling the reader to "transfer the research to their own situation" (ibid.).

young people experience in this field. Research of this kind is by nature context-bound as it occurred at particular schools and included specific groups of participants. Yet, I consider the findings relevant beyond the specific schools and participants involved. Based on literature discussed in section 2.1.3 I consider my findings an indication for the relevance of the concept of a time use competence in education settings and thus of potential relevance across different types of schools and various groups of learners. Similarly, the findings on the life world experience of time and the connection with consumer behaviour during the pandemic offer points of contact for people outside of educational contexts, even if individual experiences differ in quality.

Here, I would like to note that the research did not pay sufficient attention to participants' socio-economic backgrounds. This is discussed as a limitation in Paper 4, but I want to repeat it here because I consider it relevant regarding the overall transferability of the entire research. I consider it especially important regarding future research in time in ESE in post-pandemic education settings. Because the COVID-19 pandemic disproportionately affected students from socio-economically disadvantaged families, it would be important for research to inquire into how to address these young people and their needs. Since other researchers who have explored young people's experiences during the COVID-19 pandemic report similar difficulties in recruiting vulnerable youth as research participants (Andresen et al., 2020; Pelikan et al., 2021), this might be a structural shortcoming in the research design chosen by these authors and by myself. It would go beyond the scope of this thesis to analyse possible causes and solutions. Yet, it remains to be said that future ESE research focusing on time and sustainability might find alternative research approaches specifically targeting vulnerable youth to add to the findings presented here (Hussong et al., 2021; Hüttmann & Kutscher, 2020).

Ethics

In this section, I want to share some reflections on the research in a school setting where there were direct and indirect power imbalances, because, as Tracy (2010) points out, research ethics goes beyond responding to policies and best practices. It foremost has to respond to in how far our actions affect people involved in the research, including research participants but also other stakeholders (ibid., p. 846). Overall, the research was sensitive to ethical guidelines at all stages, adhering to guidelines for safeguarding good research practice by the German Research Foundation (Deutsche Forschungsgemeinschaft (DFG), 2022) and seeking approval of the Leuphana University's Ethics committee. In addition, studies 3 and 4 include details of how we handled issues of data protection and matters of consent regarding the participants.

Despite all the measures taken, the research occurred in an environment characterised by unequal power relations. This refers in particular to students' mandatory participation in the intervention, without the possibility to opt out.²⁷ They could only object to the use of their data for our research, which some did. Students' mandatory participation was because of administrative reasons: Since the intervention study was part of regular

²⁷ In one of the schools, the intervention was facilitated as a "voluntary mandatory class", meaning students had been able to choose among several different classes beforehand. They did not, however, have the option of switching classes after the school year had begun.

classes, students could not leave the room. Although the research team would have welcomed to make participation voluntary, this was not possible under given conditions.

It can also be questioned to what degree one's personal interests in research and academic and professional development associated with it may lead to research to become a means to an end and use participants for this goal. Here, I want to point to Shephard's (2022) statement again, stating that ESE can only be meaningfully taught and learned if facilitators also share the values and aims conveyed. Thus, I am closing this section by outlining that I am aware of the fact that my research comes with some inherent contradictions which I have not been able to solve along the way.

6.3 Reflection of my positionality

In this section, I want to reflect on the impact my positionality has had on my research – and, subsequently, how working on this dissertation has contributed to my development as an academic.

My first academic training was in social anthropology, which is why I am influenced by the ethnographic research tradition, and particularly by the “postmodern turn” following the 1980s. At the time, anthropologists were at the forefront of arguing that the qualitative researcher is always part of the research, and thus needs to reflect on her influence on it (Clifford, 1986; Marcus & Fischer, 1999; Ortner, 2016). Being aware of the role of the researcher within the research process and thus reflecting on the process on an ongoing basis is considered a means of assessing quality (Alvesson & Skjöldberg, 2018; Tracy, 2010).

What does this mean for my research, then? I came to do research for this dissertation after having worked outside of academia for almost fifteen years. Before I took the position as research associate in the ReZeitKon project, I had been working as a development consultant and an educator for global learning and ESE. I had developed an interest in sustainable consumption during my work as a seminar tutor with the German governmental voluntary ecological service²⁸. This experience eventually led me to pursue doctoral research because I felt the need to base my pedagogical work on a more informed substantive understanding of the theoretical foundations of ESC and ESE.

Because of my previous professional activities, and because of my conviction that sustainability research and practice are highly relevant and necessary to help us overcome the present global climate and sustainability crisis, the process of doctoral training was also a journey of reconciling my practitioner-slash-activist heart with my researcher heart. I remember Daniel Fischer asking once during one of our team discussions, “is this the activist or the researcher speaking?” which stuck with me, because it made me realise the cause of some of my struggles with my research. There are two parts of mine interested in ESE, the activist and the researcher, and the past almost exactly four years have been an important process of learning to reconcile these. Here, the above mentioned framework of Dillon and Wals (2006) has provided a useful guideline, showing that it is possible to conceive of *research as activism* and thus

²⁸ The voluntary service is called “Freiwilliges Ökologisches Jahr“, or voluntary ecological year, open to young people between 16 and 25 years of age.

contribute meaningfully to ESE research, rather than conceiving the two as opposites. In addition, Macintyre and Chaves' (2017) paper on "balancing the warrior and the emphatic activist" has been helpful in further clarifying my standpoint as an ESE educator/researcher/activist. They distinguish between a "warrior approach" (ibid., p. 83) aiming at fighting the system and the "empathic activist approach" seeking for "process-oriented negotiation between ways of being in the world" (ibid., p. 88). In this sense, I consider myself an empathic activist seeking to contribute to lobbying for "a more systemic and reflexive understanding of our ever-changing environment" (ibid., p. 87) via the topic of time as a dimension of sustainability.

Next to my professional experience, my background as a white, middle-class, middle-aged mother has also been a decisive influence on my perspective as a researcher. It certainly has also caused several blind spots, not all of which I will ever notice. As already noted, having been able to work in a research team and carrying out most of the research in close cooperation with my (male) colleague, Pascal Frank, has thus been a beneficial and rewarding experience. Working with school students is a particular challenge since our own experience of having spent many years within the same education system shapes our perspective on it. It was thus highly fruitful to discuss and reflect our findings against the background of our own biographies, since Pascal and I both discovered that we had made quite different experiences during our respective schooling.

Yet, my positionality may also have brought some advantages. For instance, having worked in different institutional and cultural contexts, which all came with their individual norms and conventions regarding time use and my experience as a working mother all have certainly sensitised me for how time feels differently at various stages in life, and in different personal and professional settings. This has contributed to my interest and dedication to uncover norms and practices influencing our modern approach to time, and I hope that I have been able to contribute to spark further discussion on time and its relation to sustainability in ESE and general education.

6.4 General limitations of the research

Besides the critical reflections, I would like to add some thoughts about the general limitations of the overall research project.

First, the concept of time use competence, as proposed in Paper 1, is a culturally specific concept, having emerged in response to research on time and sustainability mostly targeting modern Western societies. Thus, it is unclear whether or in how far it may be relevant when applied to non-Western socio-cultural contexts. In fact, researchers have discussed the value of alternative concepts of time for ESE (Campbell & Timmerman, 2007; Winter, 2020) and criticised Western approaches to time for obscuring global power relations (Huebener et al., 2016; Sharma, 2013). Therefore, it would be interesting for future conceptual and empirical research to bring together various strands of research of approaches to time, and how to embed this into ESE research and practice. Moreover, applying an intercultural lens to the concept of time use competence, and to the relation of time and sustainability overall, might deepen the concept and enhance its accessibility for the wider sustainability discourse.

Second, the research may not have sufficiently addressed matters of power and privilege which are inextricably linked to time use, yet often ignored or at least still too little

understood in educational institutions (Beljan, 2018; Bunn et al., 2019; Darmon, 2018; Leaton Gray, 2017). This is also related to the finding that individuals experience time differently, causing varying challenges. As mentioned, in study 4, it was not possible to interview young people from socially disadvantaged families. Also in study 3, it is unclear to what extent the socio-economic background of the participating students may have impacted their experience of time and thus their learning experience during the school intervention. In this respect, it is possible that my individual perspective on time, with its inherent biases and blind spots, contributed to a certain distortion of my view of my research subject. Future research might thus explicitly inquire into the relation between the socio-economic background of learners and matters of time to better understand the specific challenges in fostering time use competence related to individual students' backgrounds.

Third, the acquisition of time use competence is a long-term process, perhaps one of a lifetime. As with all competences, it can only be assessed in action, and it also is highly subjective because all individuals have differing time-related needs. Therefore, it is not clear how to measure time use competence, and how best to assess it. Thus, studies 3 and 4 can only represent a limited view on time use competence acquisition. It would be necessary and worthwhile to conduct follow-up studies with the participants of both studies to assess the development of their time use competence over time. Moreover, the findings indicate that individual time use depends on a variety of contextual factors, ranging from individual dispositions to socio-economic background and more. The research has not sufficiently addressed the relation between the development of time use competence in individual learners and in how far this relates to individual contextual factors.

6.5 Outlook: Recommendations for future research

In this section, I want to give an outlook for further ESE research and practice based on the synthesis provided in Chapter 6 and some of the critical reflections shared above. My exploratory research was a first endeavour to define the concept of time use competence and inquire into the use of SIBL as one possible pedagogical intervention for fostering time use competence. Future research might build on the findings in several ways.

Once, it might take up the concept of time use competence and refine or extend it to a variety of settings. It might, for instance, further inquire into implementing the SIBL approach suggested by Paper 3 and the related practitioner toolkit (Grauer et al., 2021) within various pedagogical settings. In addition, the development of other interventions aimed at fostering time use competence might also inspire future research. As pointed out above, I recommend a stronger focus on learners' socio-economic background, thus relating time use competence to evidence showing how students' time use is influenced by their socio-economic background (Darmon et al., 2019; Leaton Gray, 2017).

Next, because my research focused on individual learners and a singular pedagogical intervention, future research might focus on how to scale up time use competence approaches from singular interventions into school development, for instance, through including it into WIA and other school development processes focusing on sustainability. Individual schools and their actors will each have their own needs and demands

regarding time. It might thus be worthwhile to inquire into how to achieve time use competence at an institutional level. This might include the introduction of pedagogical interventions targeting learners on a regular basis. Furthermore, it might include teachers and other staff as subjects who may benefit from fostering time use competence and eventually lead to institutional strategic approaches to time use and relating this to sustainability.

Third, future research on the promotion of time use competence in educational settings might benefit from longitudinal studies. Time use competence is not a state, but a process developing over a longer period. As shown in Chapter 2, the experience of time is related to internalised values and practices. It occurs within a social environment that requires high demands regarding the synchronisation and organisation of time. The acquisition of time use competence thus needs ongoing processes of reflection and exchange with others, as is inherent in transformative learning processes (Mälkki & Green, 2016). Future research might thus use longitudinal research designs to observe which learning experiences occur and how individual students can be supported in developing time use competence. This refers to singular pedagogical interventions and to studies inquiring into school development.

Finally, given the ongoing repercussions of the COVID-19 pandemic regarding young people, I consider it relevant to follow up on Study 4, for instance, through further inquiring into how the experience of remote learning is continuing to shape students' time use in school learning during the next years. In addition, future research might also focus on the potential of students' everyday experiences during the pandemic regarding transformative ESE interventions and policy development. ESE research on interventions focusing on time and sustainability, individual needs and consumption might want to explore how to tap this source for future activities aimed at transformative learning.

7 Concluding thoughts

“Today is always here,” said Sethe. “Tomorrow, never.”

Toni Morrison (2007, S. 72)

The aim of my dissertation was to inquire into how ESE might address time as a resource for sustainability, both in research and via a practical pedagogical intervention within formal education. The starting point of the underlying research was the empirically proven finding that our current use of time is not sustainable because it has been found to negatively impact individual health and well-being as well as contribute to rising levels of carbon emissions. Accordingly, this inquiry into the relation between time and sustainability within ESE sought to contribute to ESE’s fundamental aim to empower learners to participate in the socio-ecological transformation.

The approach taken in this dissertation of linking individual needs satisfaction with time use competence and sustainable consumption as a framework for ESE brings together research from these different areas of sustainability for the first time. Furthermore, it proposes an approach to address these in pedagogical settings. My research thus provides insights into how time can be approached as a resource for sustainability in concrete learning situations. It also provides evidence of the particular needs and challenges that students experience in relation to their use of time within formal education. The results thus further support the hypothesis that there is a link between individual time use and sustainability. As with any research, there are many unanswered questions and suggestions for future research. I thus hope that the focus on time as a resource for sustainability will continue to receive attention in ESE. I also hope that the threads I started weaving together might be tightened more densely by future ESE practice and research.

At the time of completing this framework paper, the COVID-19 pandemic has been a defining factor in our daily lives for over two and a half years. The experiences of ‘lockdowns’, school closures and a radically altered sense of time, especially during the years 2020 and 2021, will remain in our individual and collective memories far beyond. For many working individuals, their relation to time has changed in such a way that they want to use it more autonomously. And for many younger people, it seems to be increasingly important to gain more autonomy and flexibility. To become more autonomous users of their individual time. In this context, my research could help to promote the idea of sustainability-related time use competence as an important addition to these time-related debates.

Certainly, this will not be a panacea. However, as the global climate and sustainability crisis will increasingly shape our daily lives, every effort is needed to contribute to a more sustainable future. Therefore, one strategy aiding in this effort might be to enable learners to discover and question the relationship between time and sustainability. This, as simple as it sounds, is a long-term task. However, according to my results, it seems in the realm of the possible. There is thus also a hope associated with this work. Like all those committed to the vision of sustainability, my research is driven by the hope for a better, more sustainable future. Hoping that it will be possible to achieve “what ought to be” (cf. Petersen-Boring, 2010, S. 290).

8 A personal conclusion

At the time of finishing the first draft of this framework paper, in late July 2022, I was at home, quarantined with COVID-19 for the first time during the pandemic. Until then, I had secretly hoped the whole pandemic might spare us (how presumptuous of me to assume that it just wouldn't hit my family eventually). I had it all planned: complete the first draft of the framework paper by mid-July, send it off for feedback and go on a long-awaited holiday with my family. Instead, I found myself drained of energy, frustrated at being confined to my (arguably, very comfortable) home. Here, I had to deal with the kids' disappointment over not being able to spend the holidays with their grandparents and cousins besides mine over having to delay a much-needed change in scenery after having spent most of the past six months at my little desk. On top of it, I tore the ligaments of my right ankle while running around the garden with my quarantined kids. There goes my summer holiday 2022, I thought.

Amid this mess, I came across Joni Mitchell's performance at this year's Newport Folk Festival, which had occurred a few days ago. I found it so mesmerising that I spent the rest of my quarantine listening to the recordings on YouTube. Like 79-year-old Joni, I was sitting in an armchair, impaired in my movements, but unlike her, who fought her way back to making music after suffering some major few health crises, I felt deflated. But her music also gave me hope, and the energy to pull myself up from my chair again and go on. If Joni, almost double my age, can rock a stage, so can I, I thought.

In short, those few days in July reflected much of my emotional journey during this dissertation project. It included periods of serious doubt, many moments of perplexity, but also the rare joy of having had a breakthrough. It required a lot of patience with myself, and the ability to pick myself up again after stumbling and taking a fall. And so, it is now that I get to enjoy the feeling of typing the final lines of this exercise in spinning together the red thread of my thesis.

Above all, it kept me circling around the question "Why am I doing this?" "Aren't there lots of things I'd rather spend my time doing than typing away on my laptop?" More than half of this phase fell during the COVID-19 pandemic. As for many others, the last two and a half years were filled with additional challenges. These, in turn ignited some reflection on my personal goals in life and on what I value most in life. Unlike many people, I have come through the crisis well and have even been able to complete this work without ever experiencing existential angst or other hardships. And even pay a lot of attention to my mental balance. So, I have been thinking a lot about the privileges that make such an endeavour possible for me.

The current situation of multiple crises – pandemic, war, hunger, climate change – is, in my opinion, the strongest argument for continuing an endeavour like this. Given the state of the world, what else can we do but commit ourselves to a hope for a future worth living in?

I began this dissertation project because I felt that I was lacking some relevant theoretical foundation in ESE which I might then use to improve my own practice as an educator. An indeed, the study of time and sustainability has enriched me greatly. As an academic, it has given me a vocabulary and a deeper understanding of much of what I used to do intuitively in my educational practice and which I can now reflect on a solid empirical

basis. It has helped to broaden my theoretical knowledge of ESE and deepen my insights into qualitative research. In the process, I have gone through the transformative *rite de passage* (Turner, 1969) as a doctoral candidate, at the end of which I have almost arrived.

As a person committed to sustainability and finding a way of life connecting my own needs to the human and non-human beings around me, it has further motivated me to work on what is valuable to me; not monetarily, but in terms of how I use my time. How can I spend my time in a way that makes it worthwhile? That it doesn't feel wasted? And allow myself to indulge in it. A lot of it has to do with finding the things that do us good, that bring us joy and thus give us an idea of what is worth preserving for posterity. I am indeed convinced that every human being deserves this chance and that this would be a possible strategy, even if, so far, only existing in an ideal world, to face the global climate and sustainability crisis. And such is it with time use competence. We need to be in touch with our own time-related needs and need a sense of how diverse these very needs of other people are. And this is where we can make the connection to sustainability.

The rustling of leaves in a summer breeze or the play of colours in the sunset. The smell of wheat dust, the sour taste of a fresh apple, laughing with the kids over a particularly bad joke. The time wasted in the swimming pool for a whole day or listening to the same Joni Mitchell song over and over again. The relief of writing the very last lines of a project that has been with me for a long time – there are so many things that make the moment precious and thus serve as anchors of beauty and hope in the constant cycles and trappings of everyday life. This is the first step in gaining a time use competence, and my research has taught me to look for these moments and appreciate them when they are here. Find the beauty in everyday life and assume that using your time and the time of others is worthwhile.

This is what the following lines, with which I want to conclude this framework paper, signify to me: the seasons will always go up and down, but something new always emerges and with it the possibility to hope, dream and create from the moment, thus fuelling our vision for a more sustainable world.

*There'll be new dreams, maybe better dreams and plenty
Before the last revolving year is through*

*And the seasons they go round and round
And the painted ponies go up and down
We're captive on the carousel of time
We can't return, we can only look
Behind from where we came
And go round and round and round
In the circle game.*

Joni Mitchell, "Circle Game"

9 References

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10 Appendices

A1 Glossary

A2 Zeitgestaltungskompetenz (Paper 1)

A3 Time and Sustainability. A missing link in formal education curricula (Paper 2)

A4 (Re-)learning time use and perception for sustainable development in schools
(Paper 3)

A5 Learning to spend time in unusual times (Paper 4)

A6 Declaration of authorship

A7 Declarations

A1 Glossary

The Anthropocene	A delineation of the geological epoch describing human impact on ecosystems and geology resulting in significant changes, including climate change (United Nations Development Programme (UNDP), 2020; Zalasiewicz et al., 2010). Unlike other geological epochs, the discussion around the Anthropocene engages a variety of disciplines because of its relation between geology and human history and because it includes a moral dimension, too, focusing on issues of power and responsibility for the looming climate and environmental crisis (Chakrabarty, 2018).
Consumer society	A “dominant system of social organisation” of contemporary societies (Cohen, 2017, S. v) which developed as a means of dealing with industrial overproduction. It is associated with environmental degradation and the exploitation of workers and thus global inequality, and thus considered a main driver of the present climate and sustainability crisis (Smart, 2010).
Environmental and Sustainability Education (ESE)	In contrast to the more established term Education for Sustainable Development (ESD), ESE responds to ongoing controversies about the relationship between environmental education and sustainability-related education, thus rendering it as an inclusive concept. It particularly embraces the interrelated nature of environmental, societal, political, and economic concerns (Mandikonza & Lotz-Sisitka, 2016).
Formal education	In this thesis, I follow the UNESCO’s definition for formal education which is defined as “institutionalized, intentional and planned through public organizations and recognized private bodies and, in their totality, make up the formal education system of a country” (UNESCO Institute for Statistics, 2012, S. 80).
the Global North	An analytical category, rather than referring to distinct geographical regions, the Global North denotes those regions and societies in the world that hold the most power and wealth in comparison to non-Western, or countries from the Global South. My use of the term acknowledges in particular that Western countries are the main drivers of climate change and the global environmental crisis, while being the least affected by it, resulting from centuries of colonial exploitation and oppression (Hickel, 2021).
Institution / educational institution	By institution, I refer to a public, governmental body that has a specific function within the society in which it operates. School as an educational institution is thus part of the state-organised education system and functions according to certain rules and specifications. The individual school, in turn, is an organisation that implements these specifications according to its internal, school-culture-specific symbolic order in the field of tension between possibility and limitation (Helsper, 2009).

Modern / modernity	<p>I use the terms “modern” and “Western” in relation to contemporary society as analytical categories, despite their generalising nature.</p> <p>First, I use the term “modern” following the definition of modernity as “a condition of social existence radically different from all previous forms of human existence” (Shilliam, 2017, S. 1). My use of the concept does not imply an understanding according to which there is a hierarchical, implicit relationship between “modern” and “primitive” subjects or societies (ibid.), which has long characterised the understanding of this concept within the social sciences (Marcus and Fischer 1999) and which is associated with European colonial expansion (Clifford, 1983; Said, 1978).</p>
Neoliberalism	<p>Neoliberalism is both a specific form of economic system and also a specific form of governmentality which both emphasise the decrease of governmental regulations regarding markets, the privatisation of public goods and services and the freedom and responsibility of the individual for their welfare (Harvey, 2005; Ortner, 2016).</p>
Organisation	<p>A unit that is made up of an individual composition of actors, dynamic and changing inside while delimited from the outside (Yanow & Geuijen, 2009).</p>
Research framework	<p>The research framework describes an outline of a research project, including the research rationale, research questions, the methodological assumptions, and the research methods used.</p>
Research perspective	<p>The research perspective includes the researchers’ ontological and epistemological assumptions, shaped by factors including their socio-cultural, disciplinary, and regional positionality.</p>
Sustainability	<p>The vision of granting all parts of animate and inanimate nature their right to exist (Winter, 2020). This includes recognising that the countries of the Global North are primarily responsible for the current entanglement of social and environmental crises which are tied to the history of European violent colonial expansion (Hickel, 2021; Selby & Kagawa, 2018). Although Sustainability is considered an universal vision for the global future, it is a Western concept that has developed in a specific socio-cultural context (Petersen-Boring, 2010).</p>
Sustainable Development	<p>Sustainable development as defined by the World Commission on Environment and Development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development (WCED), 1987). This approach has repeatedly been criticised for its inherent affirmation of the ideas of economic growth (Hopwood et al., 2005).</p>

The West / western

see also *the Global North*

An analytical category, not a description of distinct geographical regions, “the West” is used analogous to “the Global North” in this dissertation.

Time

- as a concept

The socio-culturally shaped mental representations which individuals have about time, rather than to an objectively existing time.

- as a dimension of sustainability

Time, how it is perceived and how it is socially organised, and how any of this will always result in certain consequences which are relevant regarding sustainability. For instance, individuals valuing speed and efficiency will probably use modes of transportation that cause high rates of carbon emission.

- as a resource for sustainability

This implies an alternative approach to the prevailing notion of time as a scarce economic resource to be used efficiently. Similar to the idea of time as a dimension of sustainability, time as a resource for sustainability implies the idea that individuals can use their time in a way that it aligns the satisfaction of their individual needs with those of other living beings.

- as a unit

Time as a unit refers to time as a unit of measurement by which it is possible to provide quantitative information within the natural sciences. It is measured as SI unit s (Bureau International des Poids et Mesures, 2022).

Time use competence

“The ability and willingness of the individual to spend their lifetime in a self-determined and self-responsible manner and to participate in shaping the social organization of time in such a way that their own need satisfaction and the need satisfaction of others living today and in the future are not jeopardized.” (*Frank et al., 2020, S. 10*)

A2 Zeitgestaltungskompetenz

Published as: Frank, P., Fischer, D., & Grauer, C. (2020). *Zeitgestaltungskompetenz*. Arbeitspapier im Forschungsprojekt ReZeitKon, Teilprojekt C: Bildung für nachhaltigen Konsum. Leuphana Universität Lüneburg.

Einleitung

Im ReZeitKon-Projekt werden Interventionen zur Förderung von Zeitgestaltungskompetenz im Privatleben, am Arbeitsplatz und in der Schule entwickelt. Die dem Projekt zugrundeliegende Hypothese ist dabei, dass eine entwickelte Zeitgestaltungskompetenz Individuen dazu befähigen könnte, Zeitwohlstand zu steigern und „freie Zeit für einen suffizienteren Lebensstil einzusetzen“ (Projektantrag, S. 4). Damit ist insbesondere gemeint, dass zeitgestaltungskompetente Personen ihr Konsumverhalten stärker an Prinzipien der Nachhaltigkeit ausrichten (können) als weniger zeitgestaltungskompetente Personen. Dem Zeitgestaltungskompetenzbegriff kommt folglich im Forschungsprojekt eine zentrale Bedeutung zu.

Das hier vorgeschlagene, sehr umfassende Verständnis von Zeitgestaltungskompetenz wurde im Kontext des Lüneburger Teilprojekts entwickelt, dem es in zweierlei Hinsicht dient: Zum einen stellt es die übergreifende Zielsetzung für die didaktisch-methodische Ausgestaltung der Bildungsintervention dar, zum anderen bietet es eine Heuristik für die empirische Untersuchung von Zeitgestaltungskompetenz bei Schüler*innen, die wir im Rahmen der ersten Durchführung der Intervention qualitativ-explorativ anlegen. Diese qualitativ-explorative Untersuchung von Zeitgestaltungskompetenz soll im zweiten Interventionshalbjahr (ab Januar 2020) zu einer Operationalisierung des Konzepts führen, auf dessen Basis auch Vorschläge für die quantitative Messung von Zeitgestaltungskompetenz gemacht werden können. Gemäß der Zielsetzung der Bildungsintervention wird Zeitgestaltungskompetenz in diesem Verständnis nicht unabhängig von, sondern bezogen auf nachhaltiges Handeln definiert, was durch die Begriffsverwendung der *Gestaltungskompetenz* als zentralem Bildungsziel in der deutschsprachigen Bildung für nachhaltige Entwicklung angedeutet ist.

Im folgenden Papier soll der Begriff der Zeitgestaltungskompetenz für den Projektrahmen näher definiert werden. Dies geschieht auf der Grundlage einiger grundsätzlicher Überlegungen zum Kompetenzbegriff sowie einer Auseinandersetzung mit bereits existierenden Definitionen des Konstrukts in der Literatur (Abschnitt 1). Die Definition des Begriffs erfolgt in Abschnitt 2. In Abschnitt 3 schlagen wir darauf aufbauend einige wichtige Aspekte von Zeitgestaltungskompetenz vor, welche in Fragebogenform in empirische Erhebungen Einzug erhalten können. Schließlich findet sich eine Reflexion unserer Definition in Abschnitt 4.

1 Zeitgestaltungskompetenz in der Literatur

In der heutigen Zeit sehen sich Menschen mit der wachsenden Herausforderung konfrontiert, ihre Lebensführung mit den zunehmend verdichteten und vertakteten Abläufen gesellschaftlicher Prozesse in Einklang zu bringen. Die Fähigkeit zur Selbstbestimmung über die eigene Zeit scheint unter diesen Bedingungen weniger eine Chance, „sondern auch eine fast ausweglose Verpflichtung“ (DGfZP, 2005, S. 19), da

sie zur sozialen Norm und damit zur Voraussetzung für gesellschaftliche Partizipation wird.

Als Lösung für diese Herausforderung wurde in den vergangenen Jahrzehnten von einigen Autor*innen das Konzept der Zeit(gestaltungs)kompetenz vorgeschlagen. Was genau mit dem Begriff gemeint ist, variiert jedoch stark zwischen den einzelnen Quellen. Eine populäre Verwendung des Begriffs (etwa Seiwert, 2006) versteht zum Beispiel Zeitgestaltungskompetenz vorrangig als Zeitmanagement, d.h. als kompetente Organisation der eigenen Lebenszeit mit Blick auf private und berufliche Ziele. Eine besondere Betonung liegt dabei auf der erfolgreichen Bewältigung beruflicher Aufgaben, weshalb (etwa Hermann, 2009) beklagt, dass dieses Verständnis von Zeitgestaltungskompetenz „den Bezugspunkt weg von Bedürfnissen hin zur ‚Zeitgewinnung‘ und Zeitplanung verschiebt und gleichzeitig eine Ökonomisierung der Definition von Zeitgestaltungskompetenz vorbereitet und einleitet“ (S. 142).

Die Deutsche Gesellschaft für Zeitpolitik (DGfZP) sieht Zeitgestaltungskompetenz derweil nicht als bloßes Mittel zur (beruflichen) Zielerreichung. In ihrem Manifest heißt es hierzu:

Die Kompetenz, die wir meinen, beschränkt sich nicht auf die äußeren Bedingungen des Umgangs mit der Zeit. Sie zielt auf die Befähigung der Menschen zum „bewussten“ Gebrauch ihrer Zeit – nach persönlichen Sinnkriterien, Interessen und Anforderungen. (DGfZP, 2005, S. 18).

Und weiter:

„Da die Kultur des Umgangs mit Zeit weniger durch vorgegebene Zeitmuster bestimmt wird, müssen die Individuen und Gruppen ihre Bedürfnisse und die Bedingungen ihrer Verwirklichung kompetent analysieren können und kreative Lösungen zunehmend selbst entwickeln. Sie müssen sich die Fähigkeit aneignen, individuelle und gemeinsame Zeiten mit ihren eigenen Sinnkriterien auf neue Weise zu verbinden.“ (ibid., S. 19).

Zeitgestaltungskompetenz im Sinne der DGfZP ist also bedürfnis- und sinnorientiert und umfasst neben der individuellen auch eine soziale Dimension.

Ein ähnliches Verständnis von Zeitgestaltungskompetenz findet sich etwa bei Reheis (2006), der in der Zeitgestaltungskompetenz eine Voraussetzung menschlicher Grundbedürfnisbefriedigung. Er sieht sie als notwendigen Ausweg aus dem „Hamsterrad“ (S. 285) der kapitalistischen Wachstumslogik, welcher er die „Idee der Selbsterweiterung des Menschen“ (Reheis, 2006, S. 255) entgegenstellt. Selbsterweiterung wird hier assoziiert mit Ideen von Glück, Wohlbefinden, Genuss und Zufriedenheit. Sie impliziert außerdem eine „ökologische Zeitgestaltung“ (ibid., S. 285), d.h. eine Zeitgestaltung, welche die Regenerationszeiten und Eigenzeiten von sich selbst und anderer Organismen und Lebewesen mitberücksichtigt. Diese Regenerations- und Eigenzeiten beschreibt Reheis – aufbauend auf die Terminologie von Held und Geißler (2000) – als „Ökologie der Zeit“ (ibid.):

„Die Ökologie der Zeit kann uns lehren, wie unbelebte und belebte Systeme in ihrem Umwelten mit Zeit umgehen, genauer: wie sie ihre Vorräte und Kräfte zeitlich klug einteilen und angemessene Zyklen und Geschwindigkeiten ausbilden.“ (ibid.)

Wesentlich an dieser Konzeptualisierung von Zeitkompetenz ist, dass die eigene Zeitgestaltung in einem größeren ökologischen Zusammenhang reflektiert wird und dass

es einen „klugen“ und „angemessenen“ Umgang mit der Zeit gibt, in welchem eigene Bedürfnisse erfüllt werden.

Über diese grundlegenden Beschreibungen hinausgehend finden sich nur wenige Versuche in der wissenschaftlichen Literatur, das Konzept der Zeitgestaltungskompetenz weiter zu systematisieren. Ein früher Beitrag hierzu findet sich bei Volker Buddrus (1995). Er versteht unter Zeitkompetenz „die selbstbewußte, von relevanten Anderen anerkannt wahrgenommene Gestaltung von persönlicher und gruppenbezogener Zeit“ (S. 90). Zentrale konstituierende Begriffe für seine Definition sind Zeitbewusstsein, Zeitwahrnehmung und Zeitgestaltung. Zeitbewusstsein bezeichnet demnach die individuelle Fähigkeit, objektive Zeitabläufe zu erfassen, wie historische Zeiträume, organismische Zeiten und Zyklen usw. Die Zeitwahrnehmung beschreibt demgegenüber die Fähigkeit, subjektive Qualitäten eines Moments erleben zu können, was Buddrus zufolge die Fähigkeit voraussetzt, sich überhaupt auf die Gegenwart einlassen zu können. Zeitgestaltung wird schließlich definiert als Fähigkeit, „Zeit im Rahmen individueller Einflussnahme bewusst gestalten zu können“ (S. 94) bzw. mit dieser souverän umgehen zu können (S. 96). Letzteres wird beeinflusst „durch die Freiheitsgrade des Individuums [...], die Ereignisse entlang der Zeitlinie zu gestalten“ (S. 89). Dabei ist wesentlich, dass Buddrus sozio-institutionelle Rahmenbedingungen als Einschränkungen anerkennt, zugleich aber die vornehmliche Limitierung von Zeitsouveränität in inneren, d.h. personalen Grenzen sieht:

„Auch hier sind oft nur die Gedanken frei. Die aktuellen Wahlmöglichkeiten sind in vielfältiger Hinsicht eingeschränkt, wobei die institutionellen Anforderungen zwar als einschränkende Bedingungen vorhanden sind, oft jedoch nur als Alibi für die Vorherrschaft von Gewohnheiten und biografischen Prägungen dienen, welche zumeist frühkindlich entstanden sind.“ (ibid., S.89)

Eine weitere Definition von Zeitkompetenz findet sich bei Renate Freericks (1996). Sie bezeichnet Zeitkompetenz als „die Fähigkeit und Bereitschaft des Einzelnen, selbstbestimmt und eigenverantwortlich die Lebenszeit zu gestalten“ (S. 15) und unterscheidet fünf Dimensionen:

organische Zeitkompetenz, welche die Sensibilisierung für die „körpereigene Zeit“ (ibid.) beschreibt

kognitive Zeitkompetenz, aufgefasst als Möglichkeit, vergangene Erfahrungen sowie Erwartungen und Ziele in das gegenwärtige Handeln einzubeziehen bzw. auf neue Situationen anzuwenden

aktionale Zeitkompetenz, „die es ermöglicht, die eigene Zeit – in Abstimmung mit äußeren und inneren Zeitvorgaben – zu strukturieren, einzuteilen und zu planen (Zeitsouveränität)

soziale Zeitkompetenz, definiert als die „Möglichkeit und Fähigkeit, Interaktionsprozesse über Zeit zu synchronisieren. Dies umfasst den (disponiblen) Wechsel zwischen verschiedenen zeitlichen Bezugssystemen und die dynamische Verbindung verschiedener Lebenszeitbereiche insbesondere durch das Aushandeln von Zeit.“ (ibid.)

emotionale/subjektive Zeitkompetenz, beschrieben als Fähigkeit, das subjektive Erleben von Zeit zu reflektieren, in persönliche Entscheidungen einzubeziehen und als Folge Zeit als erfüllt erleben zu können. Dies beinhaltet auch, „sich selbst als zeitkompetentes Wesen zu erfahren.“ (ibid.)

Eine dritte Definition von Zeitkompetenz findet sich bei Elmar Hatzelmann und Martin Held (2015). Die Autoren betonen ausdrücklich, dass Zeitkompetenz über ein bloßes Zeitmanagement hinausgeht, das eine rein quantitative Organisation von Zeit darstellt. Demgegenüber umfasst Zeitkompetenz für sie auch und vor allem einen qualitativen Umgang mit Zeit. Hatzelmann und Held schlagen ein zwölfdimensionales Zeitkompetenzkonstrukt vor, bestehend aus:

- Infoaufnahme: Verstanden als Fähigkeit, die eigene Aufnahmekapazität für neue Informationen zu prüfen und zu erkennen
- Kompass: „[L]angfristige Orientierung und Visionen, die über die Kurzfristorientierung hinausgehend Richtung geben.“ (S. 54)
- Gefühlszustand: Bezeichnet die Beurteilungsfähigkeit der eigenen Lebensqualität
- Chronotypus: Das Individuum kann seinen eigenen Zeittyp einordnen (z.B. Morgen- vs. Abendmensch usw.)
- Präsenz: Fähigkeit, im „Hier und Jetzt“ (S. 55) zu sein
- Geschwindigkeit: Kenntnis über die eigene Geschwindigkeit, in denen Tätigkeit am besten ausgeführt werden
- Rhythmus: Fähigkeit zur Wahrnehmung/Gestaltung des eigenen Rhythmus
- Chronos/Kairos: Fähigkeit zur Abschätzung des richtigen Augenblicks für anstehende Aufgaben (z.B. das Führen von wichtigen Gesprächen)
- Zeitformen/-vielfalt: Fähigkeit zur Erfassung von und sinnvollem Umgang mit unterschiedlichen Zeitformen
- Zeitempathie: Fähigkeit zur Einschätzung der zeitbezogenen Bedürfnisse einer anderen Person
- Zeitmanagement: Ist definiert als gezielte, an den eigenen Zielen orientierte Organisation und Ausführung von Aufgaben.
- Erfolg = Inhalt + Gefühl: Beschreibt die Beobachtungsgabe, das Verfolgen und Erreichen von Zielen mit dem damit einhergehenden Gefühlszustand in Verbindung zu bringen und auf dieser Basis die Wichtigkeit von ersterem einzuschätzen

Ein Überblick über die Diskussion zum Zusammenhang zwischen Zeitkompetenz und nachhaltigem Konsum findet sich bei Lucia Reisch (2015). Sie greift vor allem die Überlegungen von Galak et al. (2011, 2013) zur „temporalen Konsumkompetenz“ auf. Diese umfasst zwei Dimensionen: Zum einen geht es dabei um die Fähigkeit zur Selbstkontrolle und Selbstregulation; zum anderen ist damit Befähigung gemeint, das Verhältnis zwischen Konsum und Bedürfnis in befriedigender Weise aufeinander abzustimmen. Den Autor*innen zufolge ließe sich Überkonsum z.B. dadurch begegnen, dass sich Konsument*innen in einer Verlangsamung von Konsum üben, dadurch in derselben Zeitspanne weniger konsumieren und dies gleichzeitig als größere Befriedigung erleben.

2 Zeitgestaltungskompetenz im Projekt ReZeitKon

Grundlage für die Definition der Zeitgestaltungskompetenz im Lüneburger ReZeitKon-Teilprojekt ist die o.g. Definition von Freericks (1996), d.h. „die Fähigkeit und Bereitschaft des Einzelnen, selbstbestimmt und eigenverantwortlich die Lebenszeit zu gestalten“ (S. 15). Diese adressiert neben der Befähigung auch die persönliche Motivation zu Selbstbestimmung und Eigenverantwortung in der Zeitgestaltung und nimmt damit direkten Bezug auf die einflussreiche Kompetenzdefinition Franz Weinerts, der Kompetenzen definiert als "die bei Individuen verfügbaren oder durch sie erlernbaren kognitiven Fähigkeiten und Fertigkeiten, um bestimmte Probleme zu lösen, sowie die damit verbundenen motivationalen, volitionalen und sozialen Bereitschaften und Fähigkeiten, um die Problemlösungen in variablen Situationen erfolgreich und verantwortungsvoll nutzen zu können" (Weinert, 2002, S. 27-28). Angesichts der Nachhaltigkeitsorientierung des Projekts soll Freericks' Definition im Folgenden um zwei Aspekte ergänzt werden, nämlich (1) um eine nachhaltige individuelle Zeitgestaltung und (2) um das als *Gestaltungskompetenz* beschriebene Vermögen, gegebene Zeitstrukturen „im Sinne nachhaltiger Entwicklung modifizieren und modellieren zu können" (De Haan & Harenberg, 1999, S. 62).

Das projektbezogene Interesse an einer nachhaltigkeitsbezogenen Zeitgestaltungskompetenz basiert auf der Tatsache, dass Individuen ihre Zeit immer auch konsumptiv gestalten. Die in ReZeitKon entwickelte Bildungsintervention zu nachhaltigem Konsum zielt mithin darauf ab, Zeitgestaltungskompetenz auf eine solche Weise zu entwickeln, dass der Erwerb dieser Kompetenz Individuen ermöglicht, ihre individuelle Zeitgestaltung an den Prinzipien eines nachhaltigen Konsums ausrichten zu können. Nachhaltiger Konsum wird in diesem Papier definiert als Umgang von Individuen mit Konsumgütern, der dazu beiträgt, die notwendigen externen Bedingungen zu schaffen bzw. zu erhalten, damit Menschen in Gegenwart und Zukunft ihre Grundbedürfnisse befriedigen können, auf deren Erfüllung sie einen ethischen Anspruch haben (objektive Bedürfnisse) (Di Giulio et al., 2011; Fischer et al., 2011, S. 78).

Diese auf sozioökonomische und ökologische Aspekte des Nachhaltigkeitsbegriffs gestützte Definition lässt sich weiterhin mit Parodi und Tamm (2018) um innere (oder personale) Prinzipien der Nachhaltigkeit ergänzen. Der Umgang mit Konsumgütern leistet dann auch einen Beitrag zur Befriedigung innerer Bedürfnisse bzw. steigert allgemein die Qualität der „inneren Situation“ (S. 5). Aspekte dieser inneren Situation sind den Autoren zufolge die subjektive Wahrnehmung, Körpererfahrungen, Gedanken, Werte, Bedürfnisse, Wünsche sowie das emotionale Erleben.

Die Rückbindung dieser Überlegungen an den Begriff der Zeitgestaltungskompetenz hat zur Folge, dass letzterer nicht nur im Hinblick auf die individuelle *Disposition* zur Zeitgestaltung (Fähigkeit, Bereitschaft, Selbstbestimmung Eigenverantwortung), sondern auch auf die konkreten Inhalte und mit ihr verbundenen Konsequenzen der individuellen Zeitgestaltung gedacht wird. Insbesondere umfasst eine Zeitgestaltungskompetenz vor diesem Hintergrund die Fähigkeit, die ‚innere Situation‘ und diejenige anderer Menschen (und Lebewesen) zu kennen, anzuerkennen und das eigene Handeln mit Blick auf diese gegenwärtig und zukünftig beurteilen zu können. Diese Fähigkeit befähigt das Individuum wiederum dazu, gesellschaftlich geformte Zeitstrukturen im Hinblick auf ihre Auswirkungen auf die eigene innere Situation und diejenige anderer Menschen zu beurteilen und im Sinne von de Haans

Gestaltungskompetenz (de Haan & Harenberg, 1999) bei Bedarf so verändern zu können, dass sie eine nachhaltige Entwicklung (sozial, ökonomisch, ökologisch, personal) begünstigen.

Diese Perspektive berücksichtigend legen wir für die bildungsbezogene ReZeitKon-Intervention folgendes Verständnis einer nachhaltigkeitsbezogenen Zeitgestaltungskompetenz zugrunde:

Zeitgestaltungskompetenz bezeichnet die Fähigkeit des Einzelnen, selbstbestimmt und eigenverantwortlich die eigene Lebenszeit so zu gestalten (und damit auch die soziale Organisation von Zeit so mitzugestalten), dass die eigene Bedürfnisbefriedigung und die Bedürfnisbefriedigung anderer heute und in Zukunft lebender Menschen nicht gefährdet werden.

Zur weiteren Ausdifferenzierung des Konzepts schlagen wir vor, drei (sich überschneidende) Komponenten von Zeitgestaltungskompetenz zu unterscheiden:

(1) dem Gewahrsein für

- (a) eigene Bedürfnisse und diejenigen anderer Menschen heute und in Zukunft
- (b) gegenwärtige Zeitstrukturen, deren Gewordensein und deren Einfluss auf die Befriedigung eigener und der Bedürfnisse anderer sowie
- (c) die natürlichen Gegebenheiten und Abläufe, in deren Rahmen diese Bedürfnisse befriedigt werden können

(2) der Handlungsfähigkeit zur gezielten, an den eigenen Bedürfnissen und Zielen orientierte Organisation von Zeit sowie zur Mitgestaltung der sozialen Organisation von Zeit und schließlich

(3) die Fähigkeit zur Bereitschaft²⁹, für die eigene Zeitznutzung wie auch für eigene und die Bedürfnisse anderer Verantwortung zu übernehmen. Dies umfasst insbesondere eine Klarheit bezüglich der eigenen, nachhaltigkeitsorientierten Werte im Rahmen der persönlichen Zeitgestaltung.

Überdies differenzieren wir drei Ebenen von Zeitgestaltungskompetenz, nämlich (a) personale Zeitgestaltungskompetenz, (b) interpersonale Zeitgestaltungskompetenz und (c) transpersonale Zeitgestaltungskompetenz (siehe Abbildung 1).

1. *Personale* Zeitgestaltungskompetenz: Die personale Zeitgestaltungskompetenz ist in etwa gleichbedeutend mit der o.g. Definition nach Freericks. Sie beschreibt also die Fähigkeit des Einzelnen, selbstbestimmt und eigenverantwortlich die Lebenszeit so zu gestalten, dass sie auch einen Beitrag zur personalen Nachhaltigkeit leistet. Dies umfasst insbesondere auch ein Gewährsein für den persönlichen Chronotypus (Hatzelmann & Held, 2015), d.h. eine Sensibilisierung für die körpereigene Zeit.

²⁹ Wir teilen in diesem Papier grundsätzlich die Position von Shephard et al. (2018), dass die Motivation auf eine bestimmte Weise zu handeln von der grundsätzlichen Befähigung hierzu unterschieden werden sollte. Während letztere eine Kompetenz beschreibt, ist erstere demgemäß kein Bestandteil von Kompetenz. Die hier vorgeschlagene Bereitschaftskomponente beschreibt allerdings die Fähigkeit, sich seinen eigenen Werten und folglich fundamentalen Handlungsmotivationen im Klaren zu sein und diese folglich in konkreten Handlungssituationen aktivieren zu können.

2. *Interpersonale* Zeitgestaltungskompetenz: Das interpersonal zeitgestaltungskompetente Individuum besitzt darüber hinaus die Fähigkeit, in seiner Lebensgestaltung auch die Bedürfnisse seines unmittelbaren sozialen Umfelds zu berücksichtigen. Hierfür ist insbesondere ein Gewährsein für die zeitlichen Erfordernisse zur Erfüllung dieser Bedürfnisse Voraussetzung (Zeitempathie).
3. *Transpersonale* Zeitgestaltungskompetenz geht schließlich mit der Fähigkeit einher, kollektive Bedürfnisse gegenwärtiger und zukünftiger Generationen in der eigenen Zeitgestaltung zu berücksichtigen. Dies setzt insbesondere auch ein Gewährsein für soziale Konstruktion und Organisation von Zeitstrukturen sowie ein Verständnis natürlicher Abläufe der Umwelt voraus.

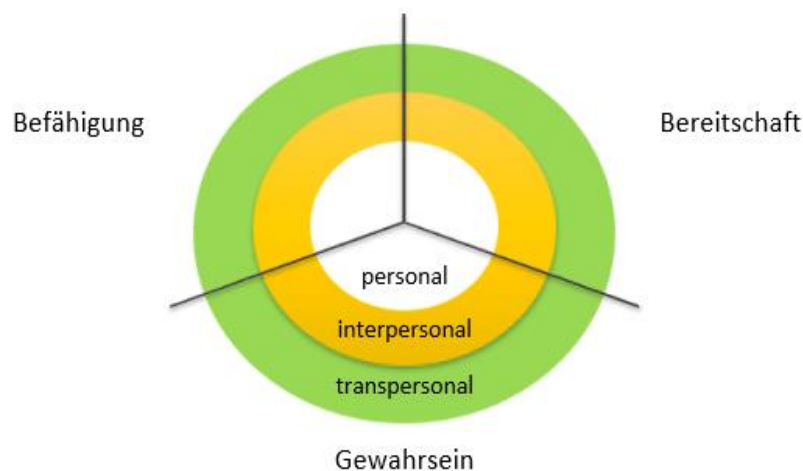


Abbildung 1: *Komponenten und Ebenen von Zeitgestaltungskompetenz.*

3 Operationalisierbare Aspekte von Zeitgestaltungskompetenz

Das hier entwickelte Verständnis von Zeitgestaltungskompetenz erhebt nicht den Anspruch von Abgeschlossenheit, sondern bleibt im Rahmen des Forschungsprozesses des Lüneburger Arbeitspakets Gegenstand kontinuierlicher Anpassung im Lichte neuer Erkenntnisse aus der qualitativ-empirischen Arbeit. Dennoch ist es ein Ziel des Projektes, das Konzept der Zeitgestaltungskompetenz auch für die quantitative Forschung zugänglich zu machen. Die folgenden Überlegungen stellen dafür erste Vorschläge zur Operationalisierung dar, die sich aus den theoretisch-konzeptionellen Grundlagen des Konzepts sowie den Eindrücken der bis dato durchgeführten Schulinterventionen zur Förderung von Zeitgestaltungskompetenz ergeben.

Für eine sehr allgemeine Erfassung von Zeitgestaltungskompetenz schlagen wir die folgenden Items vor:

Gewahrsein

- personal – Ich bin mir über meine Bedürfnisse und meine eigene Zeitgestaltung bewusst.
- Interpersonal – Ich bin mir über die Bedürfnisse meiner Mitmenschen bewusst und sehe, wie sich meine eigene Zeitgestaltung auf deren Möglichkeit auswirkt, diese Bedürfnisse zu befriedigen.
- Transpersonal – Ich bin mir darüber bewusst, dass mein Handeln einen Einfluss auf die Lebensbedingungen und die Zeitgestaltungsmöglichkeiten anderer hat.

Bereitschaft

- personal – Mir ist es ein Anliegen, meine Zeit so zu gestalten, dass es zur Befriedigung meiner Bedürfnisse beiträgt.
- Interpersonal – Mir ist es ein Anliegen, meine Zeit so zu gestalten, dass es meine Mitmenschen in ihrer Zeitgestaltung und ihrer Möglichkeit ihrer Bedürfnisbefriedigung nicht einschränkt.
- Transpersonal – Mir ist es ein Anliegen, mein Handeln so zu gestalten, dass es andere Menschen in ihrer Zeitgestaltung und ihrer Möglichkeit ihrer Bedürfnisbefriedigung nicht einschränkt.

Befähigung

- personal – Ich weiß, wie ich meine Zeit gestalten kann, um meine eigenen Bedürfnisse zu befriedigen.
- Interpersonal – Ich weiß, wie ich meine Zeit so gestalten kann, dass sie meine Mitmenschen in ihrer Zeitgestaltung und ihrer Möglichkeit ihrer Bedürfnisbefriedigung nicht einschränkt.
- Transpersonal – Ich weiß, wie ich meine Zeit so gestalten kann, dass sie andere Menschen in ihrer Zeitgestaltung und ihrer Möglichkeit ihrer Bedürfnisbefriedigung nicht einschränkt.

Für eine genaue Bestimmung und Messung einzelner Komponenten des Konstrukts „Zeitgestaltungskompetenz“ ist denkbar, auf bestehende Skalen zurückzugreifen, in welchen die Gewährseins-, Befähigungs- und Bereitschaftskomponenten des zuvor dargestellten Zeitgestaltungskompetenz-Begriffs berücksichtigt werden. So sehen wir wichtige Aspekte von Zeitgestaltungskompetenz u.a. in folgenden Skalen bzw. Teilen davon abgedeckt (ausführlich in Appendix 1):

- i. Self-reflection and insight scale (Grant et al., 2002): Deckt die Gewährseins-ebene für innere Zustände und Prozesse ab.
- ii. Personal responsibility scale (Mergler & Shield, 2016): Deckt die Bereitschaft zur eigenverantwortlichen Lebensgestaltung und der Verantwortungsübernahme für andere Bedürfnisse ab.
- iii. Time structure questionnaire (Bond & Feather, 1988; Mudrack, 1997): Deckt die Fähigkeit zur Gestaltung der eigenen Lebenszeit ab.
- iv. Erholungskompetenz (Krajewski et al., 2013): Deckt die Fähigkeit und Bereitschaft des Individuums ab, für sich selbst zu sorgen.

4 Reflexion: Zeitgestaltungskompetenz als Zielgröße der ReZeitKon-Bildungsintervention

Ein Zeitgestaltungskompetenzbegriff wie hier vorgeschlagen erweckt den Eindruck, DIE zentrale Lebenskompetenz schlechthin zu sein, beschreibt sie doch im Kern die Möglichkeit eines glücklichen Lebens im Einklang mit Prinzipien der Nachhaltigkeit. Gleichzeitig stellt sich die Frage, ob es sinnvoll ist, ein solch breiten Zeitgestaltungskompetenzbegriff zu formulieren. Insbesondere ergeben sich Zweifel an der Messbarkeit und am Mehrwert für eine empirische Forschung. Im Folgenden soll begründet werden, wieso wir einen solch weiten Zeitgestaltungskompetenzbegriff für sinnvoll halten.

Zeitlichkeit ist ein unhintergebares Faktum unseres Daseins (Heidegger, 1927). Carl Hale (1993) spricht auch von „der Währung unseres Seins, der Ablauf und die Kontinuität in der Erfahrung einer Lebensspanne“ (S. 89). Leben vollzieht sich mithin immer in der Zeitlichkeit. Ohne Zeitlichkeit ist kein Dasein, folglich kein Handeln, weder in einem nachhaltigen noch einem nicht nachhaltigen Sinne denkbar. Wo es also um eine nachhaltige Gestaltung der Gesellschaft, um nachhaltiges oder nicht nachhaltiges Handeln geht, dort ist die Zeitlichkeit schon immer impliziert.

Im ReZeitKon-Projekt soll der Zusammenhang zwischen Zeit und Nachhaltigkeit explizit gemacht werden. Das subjektive Erleben von Zeit (z.B. als Zeitnot, Zeitwohlstand etc.) und dessen Auswirkungen auf das individuelle Konsumverhalten stellen einen Fokus des Forschungsinteresses dar. Eine zentrale Frage ist hierbei, ob Individuen dazu befähigt werden können, das subjektive Zeiterleben positiv zu gestalten und in Folge dessen nachhaltigere Konsummuster entwickeln.

Den Zusammenhang zwischen Zeitgestaltung und Konsum konzipieren wir dabei über die Unterscheidung von Bedürfnissen (*needs*) und Befriedigern (*satisfiers*). Befriediger können dabei nach Manfred Max-Neef (1992) unterschiedlich „gut“ darin sein, Bedürfnisse zu befriedigen. Max-Neef unterscheidet unterschiedliche Arten von Befriedigern: von synergetischen Befriedigern, die mehrere Bedürfnisse gleichermaßen befriedigen, über Pseudo-Befriediger, die Bedürfnisbefriedigung lediglich simulieren, bis hin zu destruktiven Befriedigern, die die Befriedigung des Bedürfnisses gar verunmöglichen. Wir gehen von der Annahme aus, dass Menschen danach streben, durch ihr Handeln einen hohen Grad an Bedürfnisbefriedigung zu erreichen (=Zweck). Konsum fällt in diesem Zusammenhang jeweils unter einen der genannten Typen von Befriedigern dar und ist lediglich Mittel zum Zweck der Bedürfnisbefriedigung. Zeitgestaltung lässt sich vor diesem Hintergrund als eine notwendige Praktik verstehen, aus einer Reihe möglicher Befriediger zu wählen.

Befriediger lassen sich somit zum einen entlang der Qualität bewerten, mit der sie Bedürfnisse befriedigen. Mit der normativen Idee der Nachhaltigkeit kommen weitere ethische Anforderungen hinzu: So sind die Auswirkungen der Befriediger auf ökologische und sozioökonomische Bedingungen anderer Menschen heute und in Zukunft, ihre berechtigten Bedürfnisse zu befriedigen, einzubeziehen und damit die Frage, inwiefern die Wahl der jeweiligen Befriediger einer gerechten und sicheren Entwicklung der Weltgesellschaft zuträglich ist („safe and just operating space“, Leach et al. 2013).

Für unseren Forschungsansatz im ReZeitKon-Projekt ergeben sich aus den vorangegangenen Überlegungen dreierlei Konsequenzen für den Zeitgestaltungs-kompetenzbegriff:

Äußere Zeit ist für alle Individuen gleich. Es ist nicht möglich, im eigentlichen Sinne mehr oder weniger Zeit zu haben. Zeit lässt sich lediglich für unterschiedliche Tätigkeiten allokalieren (die wir mit Blick auf Konsum als Handlungen zur Bedürfnisbefriedigung bzw. Bedürfnisbefriedigungspraktiken konzipieren). Mit anderen Worten: Die äußere, physikalische Zeit lässt sich lediglich unterschiedlich (d.h. durch verschiedene Bedürfnisbefriedigungspraktiken) gestalten. Eine Befähigung zur positiven Gestaltung des eigenen Zeiterlebens (d.h. Zeitgestaltung als Bedürfnisbefriedigung so zu organisieren, dass keine Empfindung des Mangels resultiert) meint dann aber nichts anderes als die Fähigkeit, diese Gestaltung so vorzunehmen, dass eine hohe Qualität an Bedürfnisbefriedigung erreicht wird, was im Kern die Bedeutung von Zeitkompetenz (z.B. gemäß Freericks) ist.

Je nachdem, wie selbst- oder fremdbestimmt ich mich dann in meiner Zeitgestaltung wahrnehme, kann dies darin resultieren, dass ich zu wenig Zeit für Tätigkeiten verwende, die meine Bedürfnisse befriedigen bzw. zu viel Zeit mit Dingen verbringe, die meinen Bedürfnissen widersprechen (also Bedürfnisbefriedigung suboptimal organisiere). In beiden Fällen ist das subjektive Wohlergehen – bzw. die oben angesprochene „Qualität der inneren Situation“ – beeinträchtigt. Der Anspruch, das subjektive Zeiterleben zu verbessern, beinhaltet also eine Rückbindung der Zeitgestaltung an die subjektiv erlebte Qualität der Bedürfnisbefriedigung und d.h. an die Qualität der „inneren Situation“ (personale Nachhaltigkeitsdimension).

Der Konsumbezug des Projekts verbindet dann die personale Nachhaltigkeitsdimension (subjektiv erlebte hohe Qualität an Bedürfnisbefriedigung) mit den ethischen Anforderungen der Nachhaltigkeit (Ermöglichung der Bedürfnisbefriedigung anderer heute und in Zukunft). Da sich Konsumhandeln (i) wie jedes Handeln immer in der Zeitlichkeit vollzieht und (ii) immer Bezug auf die subjektiv erlebte Qualität von Bedürfnisbefriedigung nimmt, wird es zum direkten Gegenstand von Zeitkompetenz. Wenn also im Projekt der Anspruch verfolgt wird, individuelle Akteure über Zeitgestaltungs-kompetenz zu nachhaltigerem Konsumhandeln zu befähigen, ist in letzter Konsequenz die Fähigkeit (und Bereitschaft) ausgesprochen, die eigene Zeitverwendung als gestaltbar zu erkennen und die Wahl der (konsumptiven und nicht-konsumptiven) Befriediger so zu organisieren, dass eine hohe Qualität subjektiv erlebter Bedürfnisbefriedigung erreicht wird, ohne durch die Wahl der Befriediger zu riskieren, dass andere Menschen heute und in Zukunft ihre Bedürfnisse nicht befriedigen können.

Mit diesem Verständnis ist gegenüber verbreiteten Ansätzen in der Forschung zum nachhaltigen Konsum, die nachhaltiges Konsumverhalten als Zielvariable verstehen, eine Verschiebung in der Zweck-Mittel-Relation verbunden: Zeitgestaltung als Wahl von Bedürfnisbefriedigern zielt darauf ab, eine hohe Qualität an subjektiv erlebter Bedürfnisbefriedigung zu erreichen. Konsumhandeln bzw. konsumptive Bedürfnisbefriedigungspraktiken werden vom Zweck zum Mittel. Zugleich rücken nicht-konsumptive Bedürfnisbefriedigungspraktiken stärker in den Fokus, denn bisher beschränkt sich die Forschung zum nachhaltigen Konsum in weiten Teilen auf konsumptive Bedürfnisbefriedigungspraktiken. Ein entsprechend erweiterter Forschungsfokus bietet vielversprechende Möglichkeiten, personale (subjektiv erlebte

hohe Qualität an Bedürfnisbefriedigung) und interpersonale nachhaltigkeithische Zwecksetzungen (Ermöglichung der Bedürfnisbefriedigung anderer heute und in Zukunft) gleichermaßen zu realisieren.

Zusammenfassend lässt sich festhalten: Wo die individuelle Zeitgestaltung in Bezug gesetzt wird zu eigenen Bedürfnissen und denen anderer, wird Zeitgestaltungs-kompetenz zur nachhaltigen Lebenskompetenz schlechthin. Wenngleich wir die Grenzen der hier vorgeschlagenen Definition von Zeitgestaltungs-kompetenz für die Operationalisierung und Messung anerkennen, erscheint es uns für die ReZeitKon-Bildungsintervention notwendig, Zeitgestaltungs-kompetenz nicht unspezifisch und unabhängig von nachhaltigkeitsbezogener Gestaltungs-kompetenz (de Haan & Harenberg, 1999) zu definieren und durch die Bildungsintervention zu fördern: Vielmehr plädieren wir dafür, sie als ein integriertes Lernziel zu konzipieren und Zeitverwendung/gestaltung (verstanden als Bedürfnisbefriedigungspraktik) in direktem Zusammenhang zu nachhaltigem Konsum zu verstehen und mit den Schüler*innen auf diese Weise im Rahmen der Bildungsintervention zu untersuchen.

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A3 Time and sustainability: A missing link in formal education curricula

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Abstract

Time is an essential dimension of sustainability and its premise of intra- and intergenerational justice. Moreover, prevailing socio-cultural practices of time use are drivers of unsustainability. Educational institutions convey social norms on time and are thus places where time is “learned”. It is therefore of relevance for Education for Sustainable Development (ESD) to understand how exactly time is addressed in education. This study from Germany introduces the concept of time as a resource for sustainability before presenting an analysis of how time in this sense is addressed in 2,149 German curricula, covering all grades and school forms. Our study shows that, overall, an engagement with time as a resource for sustainability is rare in formal education. Time is mostly addressed in ethical reflections on lifetime or in teaching time management skills. We discuss implications of our findings and sketch avenues for future research on time as a resource for sustainability.

Introduction

In recent years, the relation between time and sustainability has received increased attention within sustainability research (Held, 2001; Jalas, 2004; Reisch, 2015; Seghezzi, 2009; Southerton, 2020). There is a growing body of research such as sociologist Hartmut Rosa’s theory of social acceleration (Rosa, 2011a), problematizing the negative consequences of an accelerated lifestyle. Not only does social acceleration seem to contribute to reinforcing gender inequality (Adam, 2002) and negatively affect public health (Strazdins et al., 2011) but it has also been identified as a driver of unsustainable consumption practices and thereby environmental degradation and the climate crisis (Rau, 2015; Rinderspacher, 2019). Schor’s (2005) seminal research on work-time reduction as one possible leverage point for reducing consumption levels ties in with discussions on time wealth as an important factor contributing towards more sustainable lifestyles (Reisch, 2001). There is, thus, evidence that a time use-perspective is relevant for understanding sustainability-related challenges (Rau & Edmondson, 2013) and that changing practices of time use may be an important lever to advance broader sustainability transformations (Druckman & Gatersleben, 2019; Wiedenhofer et al., 2018).

Education for Sustainable Development (ESD) is considered a “key enabler” (UNESCO, 2017, p. 7) for achieving the Sustainable Development Goals. ESD is rooted in traditions of environmental education and global citizenship education (Michelsen & Fischer, 2017). It has been established internationally as an ambitious education concept to enable all learners to address the multiple socio-ecological challenges of our times, develop solutions, and take collective action (UNESCO, 2020). Given the direct and indirect consequences of our use of time for sustainability, the ability to use the resource ‘time’ in sustainable ways should be a central focus of ESD. Indeed, there are some conceptual works (Görtler, 2016; Reheis, 2007) as well as few pedagogical practice

materials (Butler et al., 2012; Niedersächsisches Kultusministerium, 2015) exploring this link between ESD and time. However, there is so far no systematic investigation of how far and in which way ‘time’ as a resource with relevance for sustainability is addressed in curricula. Using the case of Germany as a leading country in the implementation of ESD in education policies (UNESCO, 2014), we conducted an analysis of 2,149 German state school curricula, guided by the following research questions:

RQ1: To what extent is time as a resource for sustainability addressed in German state school curricula in different school types and subjects?

RQ2: With which meanings is time as a resource for sustainability addressed in German state school curricula, and what connections are made between time and consumption?

Given the relevance of time for sustainability, we were interested in empirical evidence on whether and how formal school curricula address this nexus with an emphasis on consumption as a domain of everyday life where sustainability materializes in concrete practices and choices.

In the following sections, we are going to introduce our concept of ‘time as a resource for sustainability’ and provide a brief overview of research regarding time and sustainability, followed by the presentation of our data and a discussion of our findings and their implications with regard to ESD research and practice.

Time as a resource for sustainability

Even though we all have the same amount of time at our disposal, both our individual perception of time, and how we use it, varies considerably. This notion of a subjective time is relevant with regard to sustainability because our individual use of time is linked to the fulfilment of our personal needs. This is why in the following, rather than reflecting on time from a philosophical perspective, we are going to establish our perspective on time as a resource for sustainability and then proceed to inquire into the implications this has with regard to ESE. This conception of time as a resource for sustainability goes beyond a purely economic notion of time as a (scarce) resource which can be commodified and therefore needs to be “managed” (Southerton, 2020, p. 3) and which is considered a driver of environmental degradation and climate change (Adam, 1995).

Rather than focusing on getting things done, conceiving of time as a resource points towards doing things in ways that allow to account for one’s own needs as well as those of others.

Time and sustainability – a brief overview

Research on the interrelations between time and sustainability is becoming increasingly differentiated. For the purpose of this paper, we will briefly look at three strands of research from sociology, economics as well as education and ESD, which proved particularly insightful for providing theoretical context to our own analysis presented below.

Sociologists have long been interested in possible connections between the present environmental crisis and our (Western) social norms on time. Our ‘time culture’, i.e. how we perceive and how we are using time, they argue, is characterized by short-term, linear

thinking and a commodification of time (Nowotny, 2017; Rau & Edmondson, 2013). As a result, modern societies operate with an artificial idea of time, considered independent from the environment and its natural rhythms and cycles (Adam 1995; 2008). Even though “there is no single story about what is happening to the tempo of people’s lives” (Wajcman, 2015, p. 5), many researchers agree that capitalist principles of productivity gains in combination with technological innovations have caused an ever-increasing acceleration in Western societies, resulting in unfavorable consequences with regard to sustainability. These include the perpetuation of unsustainable consumption practices including commuting and long-distance travel by plane or car (Rau, 2015) or ‘compensatory consumption’ such as coping with stress by indulging in shopping (Rosa, 2011b).

One solution for alleviating these potentially unsustainable consequences of time scarcity has been the concept of time wealth (Reisch, 2001; Rinderspacher, 2012). There is evidence that a reduction of (paid) work hours may indeed contribute to individuals experiencing increased levels of subjective well-being (Kasser & Sheldon, 2009) as well as reducing the extent of individual consumption (Schor, 2005). Although there is evidence suggesting more free time might lead individuals to engage in more energy-intensive activities such as travel (Buhl & Acosta, 2016), Lindsay et al. (2020) point out that individuals’ time use is determined by their particular mind set meaning that more free time will not automatically cause certain more or less sustainable outcomes.

Elaborating on the relation between time use and sustainability-related outcomes, Frank et al. (2020) suggest the promotion of a ‘time shaping competence’ as an alternative to the established concept of time management. Time management skills are considered essential in modern professional and educational contexts (Dornbach, 2014; Rappleye & Komatsu, 2016) since they follow the above-mentioned approach to saving time as a scarce (economic) resource (Hatzelmann & Held, 2015). In contrast, the concept of time shaping competence proposes that we can learn to use time in a way that contributes to fulfilling our personal needs while simultaneously allowing us to reflect on the potential impacts of our time use on our surroundings, especially with regard to sustainability (Butler et al., 2012; Frank et al., 2020). Combining this perspective with our notion of time as a resource for sustainability, time shaping competence allows us to reflect on these practices and their consequences regarding ourselves, other individuals as well as the environment. This is not to suggest that a ‘time competent’ person would necessarily always act sustainably. Time use is always embedded within complex social settings, and individuals will always have to make choices, which may not always reflect their values or desires (Lindsay et al., 2020; Southerton, 2020). Nevertheless, time shaping competence aims at empowering individuals to deal with these social settings. It thus aims at enabling individuals to use their time in a way to shape the present in order to contribute to a sustainable future and thereby participating in reshaping existing social settings (cf. the concept of “shaping competence”, de Haan, 2006).

Time, education and sustainability

A perspective on time in school exposes several layers. Firstly, time is a structural element by means of which school as an institution shapes students’ lives in certain ways, for instance through timetables, or the pattern of holidays and school days. Schools thus are places of a particular kind of “temporal socialization” (Franch & Souza, 2016, p. 421), conveying social norms on time (Bunn et al., 2019; Duncheon & Tierney,

2013). In this paper, we are not going to focus on this institutional aspect of time, even though we are aware of its significance in the context of time and education.

Secondly, ‘time’ is also part of the content of curricula: From grade 1 onwards, students are learning what time is from the perspective of various subjects including physics, mathematics, philosophy or languages. So far, it remains unclear how exactly learners are introduced to curricular content on time, especially considered from our perspective on time as a resource for sustainability. Studies focusing on curricula from an ESD perspective either focus on analyzing the extent of ESD-related content in national curricula (Jóhannesson et al., 2011), the comparison of the interrelation between sustainability policies and ESD (Aikens & Mckenzie, 2021) or cross-national comparisons of subject-specific curricula (e.g. geography; Bagoly-Simó, 2014). With regard to Germany, there are studies on the inclusion of the SDGs into German education (Müller-Christ et al., 2017), ESD in primary education (Arnold, et al., 2017), or the extent of implementation of ESD in Germany in general (Holst & Brock, 2020).

With regard to ESD, time mostly seems to be dealt with in relation to the future, implying “the hope of actually *making* a sustainable future” (Holfelder, 2019, p. 945). Accordingly, there is a variety of pedagogical approaches seeking to engage learners with concrete visions of the future while developing pathways to put these visions into practice. This includes firstly sustainability assessment methods, such as life-cycle assessment (Mälkki & Alanne, 2017), which is a tool used for assessing environmental impacts of products and services. It has been suggested a useful research-based teaching method in energy education because it focuses on all steps of the value chain, including potential future environmental impacts of products, and thus emphasizing aspects such as recycling or longevity.

A second group of approaches focuses on possible development paths, one example being scenario analysis (Burandt & Barth, 2011). Originating in entrepreneurial planning, scenario analysis has been introduced to sustainability teaching because it combines a variety of methods aimed at increasing learners’ understanding of complex systemic interrelations with a focus on long-term uncertain outcomes, the global environmental crisis being a prime example for this kind of complex problem.

Finally, there are approaches encouraging learners to develop their ideas for desirable futures, such as visioning workshops (Pereira et al., 2018). This is a format aiming at creating shared social spaces allowing learners to engage with their values and foster mutual understanding in order to develop shared visions of a common future.

What all of these approaches have in common is that they conceive of the future as potentially open and malleable, and to be shaped through actions which are taking place in the now. There is, however, not yet any systematic inquiry into how exactly time as a resource for sustainability is conceived of within formal education, despite the existence of methods like those mentioned above. While some scholars have pointed out existing gaps with regard to considering time an essential dimension of sustainability in German political education (Görtler, 2016b; Reheis, 2007), we are not aware of a systematic analysis of school curricula with regard to time and sustainability, nor sustainable consumption.

This study contributes to filling this gap. It is the first analysis of German school curricula with regard to how time is addressed within public education with a focus on sustainable consumption.

Methods

We retrieved official state curricula³⁰ for all school forms and levels from the respective authorities' websites (see appendix 2 for an overview over respective sources), resulting in a total of 2,149 documents (see appendix 1). The large number stems from the fact that each of the 16 German federal states issues its own curricula and, in some cases, has introduced its own types of schools. The documents were processed using qualitative data analysis software MAXQDA and made subject to a two-step analysis. The first step aimed at identifying all sections relevant with regard to our interest in time as a resource for sustainability. We therefore ran a lexical search for the term "time" in order to identify any reference to the use of "time". Next we assessed each finding through content analysis (Mayring, 2015) in order to verify that it fit the research focus on time as a resource for sustainability. This included ruling out any term etymologically unrelated to time ("Zeit") such as "Zeitung" (newspaper), as well as references to "Zeit" (time) in terms of time as "period, time segment of life or history" (Duden, 2018). We also did not consider passages containing semantically generic or compound terms such as "Jahreszeit" (season), "Mahlzeit" (meal) as well as adjectives such as "gleichzeitig" (simultaneously), "zeitlich" (timely). Finally, we ruled out passages where time appeared as measurement or quantity such as in mathematics or physics, as a grammatical category in language teaching or as a reference to historical periods in subjects like history or politics. As a result, we identified 239 documents (out of 2,149 curricula) containing 468 references to time matching our search focus.

In a second step, we coded the material twice. Firstly, we conducted an inductive coding procedure in order to distill a set of themes capturing the specific ways in which time as a resource for sustainability was addressed in the curricula (Spichal, 2018). This was accompanied by continuous discussions within the research team, consisting of two research associates and one research assistant, in order to ensure we were applying the same standards and understandings to our data, especially in case of disagreements (Gläser & Laudel, 2010). When no further themes emerged, all identified sections were coded again by two independent coders using the agreed-upon set of seven themes as codes (see also table 2). Intercoder reliability checks using Recal2 (Freelon, 2010) revealed an acceptable rate of 95.2 percent agreement (Scott's pi (π) = 0.717, Cohen's kappa (κ) = 0.719, Krippendorff's (α) = 0.717). Please note appendix 4 in which we provide an overview over the methods and procedures in greater detail.

Results

In the following, we are going to present our findings by separately answering RQ 1 and RQ 2.

³⁰ The terms most commonly used in German are "Lehrpläne", "Bildungspläne" or "Kerncurricula".

RQ1: To what extent is time as a resource for sustainability addressed in German curricula in different school types and subjects?

Given the fragmentation of the German educational landscape, we decided to present our findings according to primary, secondary, upper secondary and vocational education level, despite occasional overlapping.

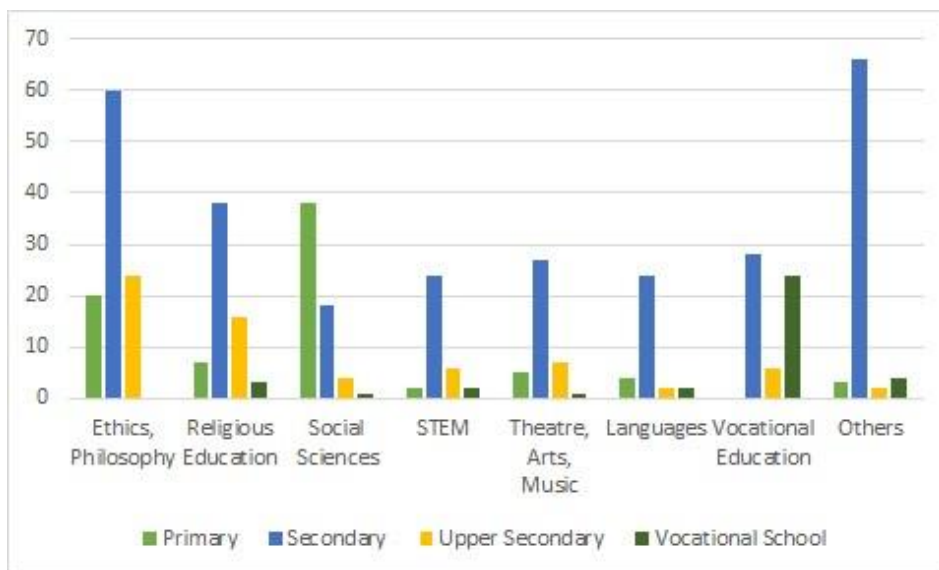
Table 1: Overview over number of documents analyzed and corresponding references to time found in relation to the number of students per school level

	No. of documents analyzed	No. of documents containing references to time	No. of references to time	Student population in Germany in 2018/19
Primary	160	35	79	3m
Secondary	1,222	143	285	4.4m
Upper Secondary	398	34	67	0.9m
Vocational	335	27	37	2.4m
Others	22*			
Total	2,149	239	486	10.7m

* 22 documents could not clearly be attributed to a particular school level; for instance, some special needs education curricula are covering primary and lower secondary level within the same document, only specifying the targeted grade in relation to specific contents.

Most references to time were found in secondary school curricula, as were the majority of documents analyzed. This can be explained by secondary level usually encompassing five or six years, thus covering more school years compared to primary (mostly four years), upper secondary (two to three years) and vocational schools (one to five years).

Figure 1. Number of references to time as a resource for sustainability per subject.



Notes: Social Sciences contains curricula for politics, geography, history, economy, social studies; religious education contains curricula for Protestant, Catholic, Islamic and other religious education; Vocational Education contains subjects at secondary, upper secondary and vocational education levels covering various contents; Others includes a variety of curricula including sports, consumer education, home economics, health-related subjects, etc.

Most references to time stem from curricula for ethics, philosophy, religious education and social sciences.³¹ For instance, “me and my time”³² is a characteristic example of an ethics curriculum approach to reflecting on time. The learning goal is described as follows:

“Being responsible for shaping one’s own time in school as well as in leisure, own wishes and goals can be expressed. (...). Life time is characterized by a continuous change: “Everything has got its time”. This includes questions about the end of life as well as coping with grief.” (EthHE1, p. 18)

Social science curricula are the only subject group in which the majority of references to time come from primary instead of secondary curricula. This is because most references to time are from general science and social studies curricula (“Sachunterricht”), a subject taught in primary schools only. Examples for relevant unit titles are “reflecting the experience of time” (SuB1, p. 27) or “subjective experience of time” (SuBW1, p. 30), showing how a reflexive approach to time is also taught at primary level. An example from a secondary level social science curriculum is a unit on “When life is more than work: e.g. the invention of leisure in the 19th century” (GewBRB1, p. 37).

Furthermore there are a number of vocational education curricula containing references to time as a resource for sustainability. These are not limited to vocational education

³¹ Religious education is compulsory in many German states. Students who opt out of participating in religious education often have to attend ethics instead – depending on the respective states’ regulations regarding participation in religious education.

In some states, philosophy is taught instead of ethics, in others, philosophy is taught as a compulsory subject throughout secondary level.

³² Direct quotes from curricula are included in English translation only and all translations are by the authors.

schools but mostly from curricula covering vocational education subjects taught at general education schools such as home economics or social pedagogy. An example for the latter would be: “[L]earning about the necessity of a conscious approach to time” (SozpädRLP2, p. 49). A second example from an economic education curriculum: Students “describe the influence of [full and part-time employment] on individual ways of life and name consequences for identity formation” (AINRW1, p. 57).

The final analytic category of “other” includes a variety of subjects from both secondary and vocational education level, which often are specific to one German federal state and include various special needs education curricula. This includes findings as this one from a curriculum on consumer education: “[Students] reflect the opportunities of time- and self-management” (VerSH1, p. 8). Another example stems from a special needs curriculum, containing “reasonably and responsibly using their [students] own time” (GeiEntNi1, p. 66)) as a learning goal.

RQ2: With which meanings is time as a resource for sustainability addressed in German curricula and what kinds of connections are made between time and consumption?

In this section, we are going to present a general overview over the themes we identified within the data, followed by an in-depth look at the findings related to time and consumption.

Main themes identified and their context

In the course of our analysis, we identified seven distinct themes, which reflect different kinds of framings with which time is addressed as a resource for sustainability in German state curricula.

Table 2. Themes identified in curricula analysis.

Theme	Reflecting individual time use	Managing time	Spending time on consumption	Experiencing leisure	Experiencing time in everyday life	Reflecting on time in general	Experiencing time in society
Coding category (German)	<i>persönliche Zeitreflexion</i>	<i>Zeitmanagement</i>	<i>Zeit und Konsum</i>	<i>Freizeit</i>	<i>Zeiterleben</i>	<i>allgemeine Zeitreflexion</i>	<i>Zeit und Gesellschaft</i>
Analytical definition	Findings refer to qualitative aspects of spending time allowing for the conclusion that students are encouraged to reflect on their individual time use.	Findings contain teaching specific methods for a “purposeful organization of time” (Hatzelmann & Held, 2015), while going beyond a “ticking-a-box” approach, and may allow for reflection on time use.	Findings establish direct relations between time and consumption, including leisure and consumption and media consumption.	Findings refer to students’ experience of “free” or “leisure” time.	Findings contain references to how individuals may perceive certain time-related phenomena e.g. calendars, holidays, or by referring to acceleration or slowing down.	Here, time is presented as a means of structuring life, collectively as well as individual. This includes various phases in life or rhythms such as natural cycles or clock-time rhythms).	Findings refer to time as experienced in modern Western societies, where time is attributed to mutually exclusive spheres (s.g. “school” or “work” time as opposed to “leisure”.)
Example*	<i>“reflecting on the meaning of becoming and passing by (...) conceiving of time as a symbol of transitoriness?”</i> (EthSA1, p.17)	<i>Students “reflect on opportunities of time and self management”</i> (VerMV2, p.18)	<i>“Assessing the interrelation between consumption habits and one’s individual lifestyle”</i> (EthGymS2, p.20)	<i>“What does leisure mean?”</i> (PhiloMP1, p.19)	<i>“Students describe individual time experience and how time is structured”</i> (GesNi3, p.13)	<i>“Time and rhythm, e.g. (...) seasonal change, life time, (...) past, present and future”</i> (FhwRLP1, p.22)	<i>“Seeking a balance – work time and leisure time”</i> (EvRelBay1, p.4)
No. of sections coded	122	87	67	65	60	45	22
% of total sections coded (n=468)	26%	19%	14%	14%	13%	10%	5%
Sections coded per level	P: 32 S: 65 U.S.: 22 V: 3	P: 5 S: 44 U.S.: 9 V.: 29	P.: 3 S.: 58 U.S.: 5 V: 1	P.: 11 S: 49 U. S.: 2 V.: 3	P.: 20 S.: 32 U. S.: 8 V.: 0	P,: 6 S.: 18 U. S.: 20 V.: 1	P.: 2 S.: 19 U. S.: 1 V.: 0
Subjects with most sections coded	Ethics/Philosophy (40 references to time as a resource)	Vocational Education (39)	Ethics/Philosophy (14)	Ethics/Philosophy (20)	Religious Education (16)	Theatre, Arts, Music (17)	Ethics, Philosophy (7)

Notes: P = Primary; S = Secondary; U.S. = Upper Secondary; V = Vocational

Table 2 provides an overview of all themes identified and their appearance with relation to subjects and school types. 'Reflecting individual time use' is the theme most frequently identified within curricula. It refers to portrayals of time use aiming at instigating students' reflections on qualitative aspects of spending their time, such as the passing of time felt during one's own life course. It is found most often in ethics and philosophy curricula.

'Managing time' is the theme represented second most often. Sections coded in this way suggest that not only are time management techniques introduced, but students' are also given space for a general reflection on their individual time use. For example, students "experience, (...) observe, (...) describe and know about the organization of their own time" (GeiEntNi1, p. 97) or "recognizing and making use of favorable learning conditions, organizing individual learning and structuring time" (EngHH1, p. 26).

'Spending time on consumption' is the third most frequently found theme, which we are going to discuss in detail below. Next, 'experiencing leisure' is another theme we identified. We mostly found it in ethics and philosophy curricula where most references to time focus on motivating students to reflect on how they are spending their leisure time. 'Experiencing time in everyday life' differs from 'experiencing leisure' in that references to time coded with the former refer to how students are experiencing the passing of time, regardless of a particular sphere such as leisure, work or home. There are, for example, a number of references to time that point to religious holidays as means of structuring the week ("Sunday is gifting us with time" (KathRelSH2, p. 42)) or "raising awareness on the difference between measured and felt time" (PhiloMV1, p. 23).

'Reflecting on time in general' is most often found in arts education curricula. Theatre curricula often seem to combine discussing time as a means of structuring time on stage with reflections of individual experiences, e.g. "reflection on acted time, timing and rhythm in theatre culture and individual projects" (PhiloHH1, p. 15). Finally, references to time grouped under 'experiencing time in society' refer to time as being structured along the areas of "school", "work" and contrasting these with time spent in "private/home" and "leisure" contexts and thereby depict established social norms on time use or the allocation of time across various spheres of social life. These coded segments often refer to how "work" and "leisure" seemingly have become essential elements defining contemporary lives: "[D]istinguishing between work time and leisure" (EthGrTh2, p. 6) or "Which is more important? Work time or leisure?" (PhiloHH1, p. 21).

The interrelation between time and sustainable consumption

Given our interest in the interrelation between time and sustainable consumption, we are going to take a more detailed look at this theme in the following section. We found 67 segments within 25 documents establishing such a relation. For analytic purposes, we further subdivided our findings into two subthemes: 'Time and consumption' and 'leisure and consumption' (see table 3). We are aware that this may appear confusing, since as we already established the theme 'experiencing leisure' above. Yet, as sections coded with 'time and consumption' frequently represent leisure as being of importance with regard to individual consumption, we decided to take a closer look at possible differences between these two subthemes.

Table 3: Overview of references to time and consumption

	Time and consumption	Leisure and consumption
Analytical definition	Sections coded suggest that a relation between time and consumption is established through putting time into context with consumption-related topics.	Sections coded establish a relation between leisure and consumption, seemingly suggesting leisure as an important realm of consumption.
Example	<p><i>“Time is money (Fast food, single-use items, fashion...)”</i> (FhwRLP1, p. 75)</p> <p><i>“Assessing consumptive behavior and personal lifestyle”</i> (EthFöS1, p. 20)</p>	<p><i>„Leisure and consumption“</i> (KathReINRW1, p. 21)</p> <p><i>„questioning the meaning and variety of media for spending leisure way”</i> (EthGrTh2, p.8)</p>
No. of findings	20	47
Findings per level	P: 0 S: 17 U.S.: 3 V: 0	P: 3 S: 41 U.S.: 2 V: 1
Subjects with most findings	Ethics/Philosophy (10 findings)	Languages (13)

Notes: P = Primary; S = Secondary; U.S. = Upper Secondary; V = Vocational

Time and consumption

Within coded sections focusing on ‘time and consumption’ (20 findings) the use of one’s time is directly related to consumptive purposes, such as “‘thought experiment’: a day without electrical energy” (EthFöS1, p. 38) or “capitalism as system of acceleration” pointing to “24-hour-consumption” (WNNi2, p. 43). In these sections, interrelations between time use and patterns of consumption appear to be starting points for discussion. Many of these contain suggestions for assignments in which students are supposed to consider possible solutions to time scarcity as one possible cause of unsustainable consumption. These sections might serve as starting point for igniting reflections on the relationship between time and sustainable consumption when taught in class.

A second example is an optional unit entitled “time is money” (FhwRLP1, p. 75) contained in various curricula from Rhineland-Palatinate, focusing on unsustainable outcomes as possible results of the notion of “time is money”, including fast food, fast fashion, or single-use items. This shows that the findings on ‘time and consumption’ appear to be influenced by sociological analyses of acceleration such as those of Rosa (2011a). Even though the overall number of findings in this context is small compared to the total number of documents analyzed, they illustrate that there are indeed a few curriculum sections pointing out the interrelation between time and sustainable consumption.

Leisure and consumption

There is a small number of curricula (46) in which an explicit connection between “leisure and consumption” (KathReINRW1, p. 21) is established, thereby presenting consumption as an activity mainly carried out during leisure. While many acts of consumption do indeed happen during leisure, our findings do not contain any corresponding sections referring to consumption also happening while spending time at school or the workplace. Instead, our findings suggest that curricula are containing normative suggestions on how there are positive as opposed to negative ways of spending one’s leisure, as illustrated for instance in a section entitled “active shaping of leisure vs. passive consumptive behavior” (FhwRLP1, p. 53).

Only 16 out of the 46 curricula containing findings on ‘leisure and consumption’ explicitly refer to potential negative consequences of time use for the environment. This includes for instance a geography unit on the “[i]mpact of leisure behavior on recreation areas and their natural geographic structure” (EkNRW1, p.26) or a home economics curriculum thematising “leisure behavior and environmental impact” (FhwRLP1, p.52). Overall, there are only few findings establishing a relation between time use and possible negative outcomes on the environment.

More than one third of the coded segments on ‘leisure and consumption’ are focusing on media consumption as a way of spending leisure. For the purpose of our analysis, we defined media consumption very narrowly, ruling out units focusing on media competence (*Medienkompetenz* in German) or those focusing on technical aspects of media use such as how to code or ten-finger typing, etc. Rather, we were interested in passages suggesting a relation between media consumption and time use, e.g. “responsible media use in leisure and school” (EngTh1, p. 52) or “questioning the variety of media for shaping leisure” (PhiloMV1, p. 24). Once more, it seems that curricula are containing distinct normative ideas on the quality of time spent on certain activities during leisure. This is further illustrated by several references to ‘time and consumption’ suggesting that students “find alternatives to watching TV and computer games during leisure” (PhiloMV1, p. 22) or encouraging them to look “for non-media-related alternatives for spending leisure” (WeS3, p. 29).

Discussion

Within the next paragraphs, we will be focusing on three main observations regarding the relation between time and sustainability in German curricula, before attempting a more general outlook on the implications we consider important in the context of ESD.

The limited extent of dealing with time as a resource for sustainability in German curricula

Regarding RQ1, *To what extent is time as a resource for sustainability addressed in German state school curricula in different school types and subjects?* our findings illustrate that a perspective on time as a resource for sustainability is rarely found within German curricula. We pointed out how time as a resource for sustainability is mostly dealt with in subjects like philosophy, social sciences and religious education. This is not surprising as these are traditionally the kinds of subjects where social phenomena are approached from a reflexive perspective. Moreover, this kind of reflexive approach to time is mostly taught at secondary level, which may at least partly be explained by the fact that with advanced age, it is possible to ignite more complex discussions and

processes of reflection among students (Dornheim & Weinert, 2019). Yet, there is a comparatively smaller number of references to time as a resource for sustainability at upper secondary or vocational education level curricula, which may be explained by both education levels covering comparatively fewer years than secondary level. Moreover, education at upper secondary and vocational levels focuses more on students' final exams (i.e. university entrance qualification or final exams required for the completion of vocational training), and thus giving greater weight to main subjects such as mathematics or languages than to other subjects.

Given the overall small number of findings on time as a resource for sustainability, it is not surprising that we found few curricula containing sections that relate time and sustainability, or, more specifically, time and sustainable consumption to each other. This corresponds with our observation whereby the perspective on time as an important dimension of sustainability is not yet prominently included in neither education policy nor practice – and thus unsurprisingly not yet prominently included in curricula either.

Perpetuation of social norms on time

When time in German curricula is dealt with from a reflexive perspective, this is mostly found in subjects like philosophy, ethics or religious education, and most often in general education curricula at secondary level. Time in vocational education curricula by contrast is almost exclusively approached from a technical-managerial perspective. As pointed out above, findings from vocational school curricula, while representing only 7.9 percent of overall findings, contain roughly 45 percent of all 87 findings on the theme of 'time management'. Reflexive perspectives on time are therefore likely most often taught at general education schools, considerably less at upper secondary level, and only rarely in vocational schools.

This observation provides evidence that schools are contributing to reinforcing existing social norms of time in the context of societal acceleration (Buddeberg & Hornberg, 2017). Various studies on young people's time use in Western societies point out that time required for school and learning is considered as the main cause for stress and pressure among students (Brannen & Nilsen, 2002; Darmon, 2018; Thing et al., 2015). Time in education is generally experienced as scarce and therefore in need to be "managed" and used "efficiently" (Dornbach, 2014, pp. 44-45). Modern pedagogy, Gravesen and Ringskou (2017) suggest, has become a "timeagogy", where "time and time pressure [constitute] an accelerated pedagogy that deeply affects the everyday practices of pedagogues and their relationships with the children" (ibid., p. 174). Modern schooling thus seems to contribute to teaching young people the ability of "squeezing time" (Southerton, 2003), thereby resulting in the perpetuation of those kinds of individual time use which we identified among the causes of unsustainable practices.

Presentation of consumption as part of individual leisure sphere

We found that the connection between time and sustainable consumption is very rarely presented by German curricula. Where it does occur, it is striking that consumption is mostly described as being part of students' leisure sphere. While the connection between leisure and consumption is obvious and well-evidenced (Druckman & Gatersleben, 2019; Röpke & Godsessen, 2007), we see three shortcomings with this approach: Firstly, it omits relevant consumptive practices associated with any kind of school-related activity

including transportation, acquiring school supplies or options for school lunch. Secondly, it falls short of providing students with the bigger picture: Rather than just focusing on their individual behavior, it might for instance be possible to enable students to better understand the underlying systemic causes of unsustainable consumption practices (see e.g. Grunwald, 2010; Sutoris, 2019). Thirdly, the focus on leisure and consumption might contribute to obscure the fact that all other areas of our time use also have potentially negative impacts on the environment.

With regard to time use and sustainable consumption, this would have to include a stronger focus on the school as a “setting” where students are spending considerable amounts of time which in turn has implications on their everyday consumptive behavior (Fischer, 2011) – which in turn can, at least partly, be influenced by individual time use decisions. This includes, for instance, transportation to school and back home, or food practices including bringing snacks or buying meals provided by the school cafeteria. Considering the ongoing expansion of all-day schools in Germany³³, young people are experiencing an increasing overlap between school and leisure, e.g. through sports or music practice taking place at schools during afternoons (Blumentritt et al., 2014; Soremski & Lange, 2010). These blurring boundaries between “school” and “leisure” might then serve to provide a variety of tangible entry points into discussions of consumption as a crosscutting element characterizing and being related to the various spheres of spending one’s time, instead of focusing on isolated spheres like leisure.

Implications for ESD

So far, we have shown that the perspective on time in German curricula is mostly one that understands time as a scarce economic resource. Moreover, curricula predominantly present consumption as something that takes place outside of school instead of pointing out how consumption is linked to all areas of life. With regard to ESD, this leaves room for a more sophisticated engagement with time as an essential dimension of sustainability. We would like to conclude our discussion with suggesting four implications for further research and practice within ESD.

First, we consider the time perspective useful for school development from an ESD perspective. While there are a number of practitioners and researchers emphasizing the need for re-thinking time in education (Drews, 2008; Lingard & Thompson, 2017; Reheis, 2007), it remains contested how such a shift might look like. Considering time as an essential dimension of sustainability we suggest that it readily connects to the long-standing discussion of whole school approaches for ESD (e.g. Mathar, 2015; Mogren, 2019) (where, ironically, teachers and school administrators often mention lack of time as a main hurdle to implementation (Hargreaves, 2008)). In this context, school development dedicated to sustainability-related outcomes would need to focus on institutional aspects of time as well as on individual time use, e.g. through promoting time shaping competence both within curricula as well as in everyday learning and teaching practices.

³³ All-day schools have only been widely introduced in Germany since the year 2003. Per definition, an all-day school needs to offer supervision of students for at least three days per week with at least seven full hours per day. As per 2017, about 70% of German public schools were all-day schools (Kultusministerkonferenz, 2019).

A second implication is that we consider our findings of potential value for curriculum development. At present, ESD is mainstreamed into German curricula at an increasing rate (von Seggern, 2019). We thus consider our findings important for policy makers interested in extending ESD-related content in curricula, both related to individual subjects, but also as a cross-cutting issue, since time and time use are highly cross-cutting topics as well. With regard to the German-speaking education context, time shaping competence as suggested by Frank et al. (2020) readily connects to the core concept of “shaping competence” for ESD (“Gestaltungskompetenz”) (de Haan, 2006). It includes the ability of thinking and acting anticipatorily with regard to sustainable development and thus already provides a framework for including the perspective on time and sustainability more prominently within ESD discourse and practice.

Thirdly, our findings might serve to spark future research inquiring into the complex relations between time and sustainability in physical school settings, as well as into the various ways contents of curricula are taught in class. Since curricula come with a certain freedom for interpretation, research about individual teachers’ approaches to time and sustainability in the classroom might certainly serve to enhance the understanding of how to establish the topic of time as a dimension of sustainability within formal education.

Finally, our findings might provide a starting point for developing teaching materials on time and sustainability similar to Butler et al. (2012) or Grauer et al. (2021). Formal education experts as well as other actors including NGOs working in ESD contexts could engage with and thus contribute to promoting the concept of time as a resource for sustainability independent from the more formalized and lengthy process of mainstreaming it into formal education curricula.

Limitations

We acknowledge some limitations related to our research. Firstly, we limited our search to the actual term “time” (*zeit*). We may therefore have missed sections dealing with time-related issues which do not contain the term *zeit*, such as “acceleration” (“*Beschleunigung*”). This decision was made for two reasons; pragmatically, to keep the body of data within feasible dimensions. Conceptually, we were interested in how time is framed as a concept, which we were only able to elicit by searching for explicit usages of the term. Future research could expand this study by using more extensive search strings that include also more implicit references to time use.

Secondly, it is possible that we have overlooked sections that do not meet our criteria, but which nonetheless serve as starting points for teaching about time as a resource. For example, time as a unit of measurement in mathematics did not fit our selection criteria, yet teachers could also motivate their students to reflect on individual time use in this context.

Conclusion

Our analysis of German curricula aimed at providing empirical evidence on whether and how curricula contain references to time as a resource for sustainability. We found that the interrelation between time and sustainable consumption is rarely discussed – neither, it seems, in most subjects overall, nor within sections focusing on ESD-related content. Based on these findings, we suggest two possible starting points for future inquiry.

First, there is a lack of research on how time is taught, learned, and experienced in schools, especially from the perspective of time as a resource for sustainability. This would include a systematic analysis of how time is treated in different subjects and how it is generally handled in classroom settings, for instance through using ethnographic approaches. It would also mean examining whether and how these various practices and contents related to time are connected to young peoples' sustainability-related consumption practices. Research of this kind might also include a focus on school as a time-shaping institution which is perpetuating norms of social acceleration. This would entail studying the manifold time structures which characterize educational institutions, such as timetables, which organize learning in forms of fixed collective rhythms, or requirements, which extend beyond the actual school day such as homework and thereby extend school time into other spheres of students' lives.

In addition, given the considerably large periods which curriculum development processes usually require, we consider it relevant for ESD practitioners and researchers to work bottom up and try out and experiment with approaches motivating students to reflect on their individual time use and link this to questions of sustainability. This would imply a systematic search for, testing and evaluation of learning activities enabling learners to build time shaping competence. The concept of time as a resource for sustainability presented in this paper might serve as one starting point for such a venture.

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Appendices

Appendix 1 – Overview over total number of curricula, number of documents identified and text sections identified per federal state

Federal State	Total no. of curricula documents	Documents containing sections identified	% of documents containing sections identified	No. of findings in total
Baden-Württemberg	120	22	21%	54
Bavaria	398	18	5%	24
Berlin Brandenburg	78	13	16%	22
Bremen	104	7	7%	12
Hamburg	103	12	12%	20
Hesse	56	7	13%	9
Mecklenburg Western Pomerania	127	9	7%	18
Lower Saxony	139	20	14%	28
Northrhine-Westphalia	101	13	13%	21
Rhineland-Palatinate	116	27	23%	86
Saarland	262	14	5%	25
Saxony	194	25	13%	37
Saxony-Anhalt	75	13	17%	30
Schleswig-Holstein	150	22	15%	44
Thuringia	127	17	13%	38
Total	2149	239		468
<i>Average</i>			13%	

Notes: Curricula documents: Curricula are, in general, published per subject, school form and grade, e.g. “Mathematics, Primary School, grade 1”; and are available as PDF online via education authorities of each state. Their number per state varies greatly because some states have issued individual curricula per each subject, school type and grade whereas others are combining curricula for various school types or grades, thus resulting in numbers varying between 56 (Hesse) and 398 (Bavaria).

Documents containing sections identified Number of documents in which we identified passages relevant to our search on “time as a resource”

Appendix 2 – Sources for curricula document downloads per federal state

Baden-Württemberg

Ministerium für Kultus, Jugend und Sport, Baden-Württemberg (2016). *Bildungspläne 2016*. Retrieved November 4, 2018, from <http://www.bildungsplaene-bw.de/,Lde/Startseite/Informationen/Impressum>

Berlin Brandenburg

Bildungsserver Berlin Brandenburg (n.d.). *Rahmenlehrpläne*. Rahmenlehrpläne und Materialien. Retrieved November 3, 2018, from <https://bildungsserver.berlin-brandenburg.de/unterricht/rahmenlehrplaene>

Bavaria [Bayern]

Staatsinstitut für Schulqualität und Bildungsforschung München (n.d.). *Lehrplan*. München. Retrieved November 03, 2018, from <http://www.isb.bayern.de/schulartspezifisches/lehrplan/>

Bremen

Landesinstitut für Schule Bremen (n.d.). *Bildungspläne nach Stufen*. Retrieved October 30, 2018, from <https://www.lis.bremen.de/sixcms/detail.php?gsid=bremen56.c.15219.de>

Hamburg

Behörde für Schule und Berufsbildung (n.d.). *Bildungspläne*. Retrieved November 03, 2018, from <https://www.hamburg.de/bildungsplaene>

Hesse [Hessen]

Hessisches Kultusministerium (n.d.). *Kerncurricula*. Retrieved November 04, 2018, from <https://kultusministerium.hessen.de/schulsystem/bildungsstandards-kerncurricula-und-lehrplaene/kerncurricula>

Mecklenburg Western Pomerania [Mecklenburg-Vorpommern]

Bildungsserver Mecklenburg-Vorpommern (n.d.). *Rahmenpläne an allgemein- bildenden Schulen*. Schwerin. Retrieved November 04, 2018, from <https://www.bildung-mv.de/schueler/schule-und-unterricht/faecher-und-rahmenplaene/rahmenplaene-an-allgemeinbildenden-schulen/>

Lower Saxony [Niedersachsen]

Niedersächsisches Kultusministerium (n.d.). *Verzeichnis der niedersächsischen Lehrpläne*. Hannover. Retrieved November 03, 2018, from https://www.mk.niedersachsen.de/startseite/service/rechts_und_verwaltungsvorschriften/lehrplaene/lehrplaene_allgemein_bildende_schulen/lehrplaene-allgemein-bildende-schulen-6378.html

NRW

Qua-Lis NRW (n.d.). *Lehrplannavigator*. Qualitäts- und Unterstützungsagentur - Landesinstitut für Schule. Soest. Retrieved November 04, 2018, from <https://www.schulentwicklung.nrw.de/lehrplaene/>

Rheinland-Pfalz

Bildungsserver (n.d.). *Lehrpläne*. Bildungsserver Rheinland-Pfalz. Retrieved November 04, 2018, from <https://lehrplaene.bildung-rp.de/>

Saarland

Bildungsserver (n.d.). *Lehrpläne und Handreichungen*. Ministerium für Bildung und Kultur Saarland. Saarbrücken. Retrieved November 04, 2018, from <https://www.saarland.de/lehrplaene.htm>

Sachsen

sachsen.de (n.d.). *Verzeichnis der Lehrpläne & weiterer Materialien*. Sächsisches Landesamt für Schule und Bildung. Dresden. Retrieved November 04, 2018, from <https://www.schule.sachsen.de/lpdb/>

Sachsen-Anhalt

Bildungsserver Sachsen-Anhalt (n.d.). *Lehrpläne/ Rahmenrichtlinien*. Landesinstitut für Schulqualität und Lehrerbildung Sachsen-Anhalt. Halle. Retrieved November 04, 2018, from https://www.bildung-lsa.de/lehrplaene___rahmenrichtlinien.html

Schleswig-Holstein

Institut für Qualitätsentwicklung an Schulen Schleswig-Holstein (n.d.). *Lehrpläne des Landes Schleswig-Holstein*. Kiel. Retrieved November 04, 2018, from <https://lehrplan.lernnetz.de/>

Thüringen

Thüringer Schulportal (Erfurt) (n.d.). *Thüringer Lehrpläne*. Thüringer Ministeriums für Bildung, Jugend und Sport. Retrieved November 04, 2018, from <https://www.schulportal-thueringen.de/lehrplaene>

Appendix 3 – Curricula quoted in Results section

- ALNRW1: Ministerium für Schule und Weiterbildung des Landes Nordrhein- Westfalen (2013). *Arbeitslehre. Hauswirtschaft, Technik, Wirtschaft*. Retrieved November 04, 2018, from <https://www.lehrplannavigator.nrw.de>
- AnSH1: Ministerium für Bildung, Wissenschaft, Forschung und Kultur des Landes Schleswig-Holstein (n.d.). Anhang. Kommentare zu den vierzehn Leitthemen und Didaktische Landkarten. Ministerium für Bildung, Wissenschaft, Forschung und Kultur des Landes Schleswig-Holstein (Ed.). Retrieved November 04, 2018, <https://lehrplan.lernnetz.de/index.php?wahl=4>
- EkNRW1: Ministerium für Schule und Weiterbildung des Landes Nordrhein- Westfalen (2011). *Kernlehrplan für die Realschule in Nordrhein-Westfalen*. Retrieved November 04, 2018, from <https://www.lehrplannavigator.nrw.de>
- EngHH1: Die Senatorin für Bildung und Wissenschaft (2008). *Berufliche Bildungsgänge mit Erwerb der Fachhochschulreife. Englisch Sekundarstufe II*. Retrieved November 04, 2018, from https://www.lis.bremen.de/schulqualitaet/curriculumentwicklung/-bildungsplaene/sekundarbereich_ii_berufsbildend-15316
- EngTh1: Thüringer Ministerium für Bildung, Wissenschaft und Kultur (2011). *Englisch. Lehrplan für den Erwerb des Hauptschul- und des Realschulabschlusses*. Retrieved November 04, 2018, from <https://www.schulportal-thueringen.de/lehrplaene>
- EthFöS1: Sächsisches Bildungsinstitut (2017). *Lehrplan der Schule mit dem Förderschwerpunkt geistige Entwicklung. Ethik*. Retrieved November 04, 2018, from <https://www.bildung.sachsen.de/apps/lehrplandb/>
- EthGrTh2: Thüringer Ministerium für Bildung, Wissenschaft und Kultur (2010). *Lehrplan für die Grundschule und für die Förderschule mit dem Bildungsgang der Grundschule. Ethik*. Retrieved November 04, 2018, from <https://www.schulportal-thueringen.de/web/guest/lehrplaene/grundschule>
- EthGymS2: Sächsisches Staatsministerium für Kultus und Sport (2004/2009/2011). *Lehrplan Gymnasium: Ethik*. Retrieved November 04, 2018, from <https://schule.sachsen.de/lpdb/>
- EthHE1: Hessisches Kultusministerium (2011). Ethik. Primarstufe. In: *Bildungsstandards und Inhaltsfelder - Das neue Kerncurriculum für Hessen*. Retrieved November 03, 2018, from <https://kultusministerium.hessen.de/schulsystem/bildungsstandards-kerncurricula-und-lehrplaene/kerncurricula/primarstufe/ethik>
- EthSA1: Kultusministerium Sachsen- Anhalt (n.d.). *Fachlehrplan Grundschule: Ethikunterricht*, Retrieved November 04, 2018, from https://www.bildung-lsa.de/lehrplaene___rahmenrichtlinien.html
- PhiloHH1: Behörde für Schule und Berufsbildung (2011). *Bildungsplan Gymnasium Sekundarstufe I. Philosophie*. Retrieved November 03, 2018, from <https://www.hamburg.de/bildungsplaene/2363352/gym-seki/>
- EvRelBay1: Staatsinstitut für Schulqualität und Bildungsforschung München (2018). *Fachlehrpläne Mittelschule: Evangelische Religionslehre M8*. Retrieved November 03, 2018, from <https://www.isb.bayern.de/schulartspezifisches/lehrplan/>
- FhwRLP1: Ministerium für Bildung, Wissenschaft und Weiterbildung (1999). *Lehrplan Wahlpflichtfach Familienhauswesen. Realschule*. Retrieved November 04, 2018, from <https://lehrplaene.bildung-rp.de/>

- GeiEntNi1: Niedersächsisches Kultusministerium (2007). *Kerncurriculum für den Förderschwerpunkt Geistige Entwicklung. Schuljahrgänge 1-9*. Retrieved November 03, 2018, from <https://db2.nibis.de/1db/cuvo/ausgabe/>
- GesNi3: Niedersächsisches Kultusministerium (2015). *Kerncurriculum für das Gymnasium Schuljahrgänge 5-10: Geschichte*, Retrieved November 03, 2018, from <https://www.cuvo.nibis.de>
- GewBRB1: Landesinstitut für Schule und Medien Berlin-Brandenburg (n.d.). *Teil C Gesellschaftswissenschaften. Jahrgangsstufen 5/6*. Retrieved November 03, 2018, from <https://bildungsserver.berlin-brandenburg.de/unterricht/rahmenlehrplaene>
- KathRelNRW1: Ministerium für Schule und Weiterbildung des Landes Nordrhein-Westfalen (2013). *Katholische Religionslehre. Kernlehrplan für die Hauptschule in Nordrhein-Westfalen*. Retrieved November 04, 2018, from <https://www.lehrplannavigator.nrw.de>
- KathRelSH2: Ministerium für Bildung, Wissenschaft, Forschung und Kultur des Landes Schleswig-Holstein (n.d.). *Lehrplan Grundschule: Katholische Religion*. Retrieved November 04, 2018, from <https://lehrplan.lernnetz.de/>
- PhiloMV1: Minister für Bildung, Wissenschaft und Kultur (n.d.). *Rahmenplan Philosophieren mit Kindern. schulartenunabhängige Orientierungsstufe, Klassenstufe 5-6*. Retrieved November 04, 2018, from <https://www.bildung-mv.de/schueler/schule-und-unterricht/faecher-und-rahmenplaene/rahmenplaene-an-allgemeinbildenden-schulen/philosophie/>
- SozpädRLP2: Ministerin für Bildung, Frauen und Jugend (1999). *Wahlpflichtfach Sozialpädagogik: Sekundarstufe I 9. und 10. Klasse der Realschule*. Retrieved November 04, 2018, from <https://lehrplaene.bildung-rp.de/>
- SuB1: Der Senator für Bildung und Wissenschaft (2007). *Sachunterricht. Bildungsplan für die Primarstufe*. Retrieved October 30, 2018, from <https://www.lis.bremen.de/-schulqualitaet/curriculumentwicklung/bildungsplaene/primarstufe-15222>
- SuBW1: Ministerium für Kultus, Jugend und Sport, Baden-Württemberg (2016). *Sachunterricht*. In *Bildungsplan der Grundschule*, Bd. 12. Retrieved November 04, 2018, from <https://www.bildungsplaene-bw.de/,Lde/LS/BP2016BW/ALLG/GS/SU>
- VerSH1: Ministerium für Bildung und Frauen des Landes Schleswig-Holstein (2009). *Lehrplan für die Sekundarstufe I der weiterführenden allgemeinbildenden Schulen Regionalschulen, Gemeinschaftsschulen, Förderzentren: Fachliche Konkretionen Verbraucherbildung*. Retrieved November 04, 2018, from <https://lehrplan.lernnetz.de>
- WeS3: Sächsisches Staatsministerium für Kultus und Sport (2005/2010). *Lehrplan Schule zur Lernförderung. Werken*. Retrieved November 04, 2018, from <https://www.schule.sachsen.de/lpdb/>
- WNNi2: Niedersächsisches Kultusministerium (2018). *Werte und Normen. Kerncurriculum für das Gymnasium – gymnasiale Oberstufe die Gesamtschule – gymnasiale Oberstufe das Berufliche Gymnasium das Kolleg*. Retrieved November 03, 2018, from <https://www.cuvo.nibis.de>
- WUETH3: Thüringer Ministerium für Bildung, Wissenschaft und Kultur (2012). *Wirtschaft-Umwelt-Europa. Lehrplan für den Erwerb des Hauptschul- und des Realschulabschlusses*. Retrieved November 04, 2018, from <https://www.schulportal-thueringen.de/lehrplaene>

Appendix 4 – Technical Report

Note to the reader: In this annex, we present the methodological procedure of the curriculum analysis in more detail than in the corresponding section of the paper. Here you will find some excerpts from the paper, enriched with more detailed information on our methodological approach.

Study Aim and Research Questions

In order to systematically investigate how far and in which way time as a resource with relevance for sustainability is addressed in curricula, we undertook a curriculum analysis. Using the case of Germany as a leading country in the implementation of ESD in education policies (UNESCO, 2014), we therefore reviewed 2,149 German state school curricula, guided by the following research questions:

RQ1: To what extent is time as a resource for sustainability addressed in German state school curricula in different school types and subjects?

RQ2: With which meanings is time as a resource for sustainability addressed in German state school curricula, and what connections are made between time and consumption?

Study Design

Throughout the process we worked in a research team consisting of two research associates and one research assistant. We began our analysis by gathering all German curricula operational in school year 2018/19; the school year our research took place in. We first downloaded the curricula from respective authorities' websites (see appendices 1 and 2) where they are publicly accessible in PDF format. The large number stems from the fact that each of the 16 German federal states issues its own curricula and, in some cases, has introduced its own types of schools.

Documents were then analyzed using software program MAXQDA by a two-step analysis procedural approach:

1. Identification of sections relevant to our research interest in time as a resource for sustainability
2. Coding of identified sections in order to arrive at a set of themes describing the content of identified sections

1. Identification of sections relevant to our research interest in time as a resource for sustainability

- We first ran a lexical search for the search term "zeit" ("time") to identify sections containing references to time.
- We only included those sections containing concrete suggestions of teaching content, leaving out all other parts of the documents such as introductory chapters, appendices, or general advice regarding competences learned or evaluation criteria as we were primarily interested in content, which would likely be taught in classroom settings.
- Next we assessed every section manually through content analysis (Mayring, 2015) in order to decide whether the notion of time mentioned was relevant with regard to our interest in time as a resource of sustainability. Therefore we

defined the following exclusion criteria (meaning the sections containing any of the following meanings of “zeit” (time) were not considered for further analysis):

- terms etymologically unrelated to time (“Zeit”) such as “Zeitung” (newspaper) or “Zeitzeuge” (witness of a time period)
 - references to “Zeit” (time) in terms of time as “period, time segment of life or history” (Duden, 2018)
 - passages containing semantically generic or compound terms such as “Jahreszeit” (season), “Mahlzeit” (meal) as well as adjectives such as “gleichzeitig” (simultaneously), “zeitlich” (timely)
 - passages where time appeared as a means of measurement or quantity, e.g. in mathematics or physics curricula
 - references to time as a grammatical category in language curricula
 - references to time related to specific historical periods in subjects like history or politics
- We thus identified 239 documents containing 468 references matching our notion of time as a resource for sustainability out of 2,149 curricula.

2. Coding of identified sections in order to arrive at a set of themes describing the content of identified sections

- We then began coding the 468 identified sections by an inductive coding procedure in order to distill a set of themes capturing the specific ways in which time as a resource for sustainability was addressed in curricula (Spichal, 2018).
- Coding was accompanied by continuous discussions within the research team in order to ensure we were applying the same standards and understandings to our data, especially in case of disagreements (Gläser & Laudel, 2010).
- When no further themes emerged, we arrived at a definite list of seven themes representing the various approaches to time as a resource within German curricula. (See table 2 as well as the table below)

Theme (English translation)	Theme (German terminology)	Definition
Reflecting individual time use	persönliche Zeitreflexion	Findings refer to qualitative aspects of spending time allowing for the conclusion that students are encouraged to reflect on their individual time use.
Managing time	Zeitmanagement	Findings contain teaching specific methods for a “purposeful organization of time” (Hatzelmann & Held, 2015), while going beyond a “ticking-a-box” approach, and may allow for reflection on time use.
Spending time on consumption	Zeit und Konsum	Findings establish direct relations between time and consumption, including leisure and consumption and media consumption.
Experiencing leisure	Freizeit	Findings refer to students’ experience of “free” or “leisure” time.

Experiencing time in everyday life	Zeiterleben	Findings contain references to how individuals may perceive certain time-related phenomena e.g. calendars, holidays, or by referring to acceleration or slowing down.
Reflecting on time in general	Allgemeine Zeitreflexion	Here, time is presented as a means of structuring life, collectively as well as individual. This includes various phases in life or rhythms such as natural cycles or clock-time rhythms.
Experiencing time in society	Zeit und Gesellschaft	Findings refer to time as experienced in modern Western societies, where time is attributed to mutually exclusive spheres (s.g. “school” or “work” time as opposed to “leisure”.)

- All sections identified in the first step were then recoded a second time by two independent coders (one research associate and one research assistant) using the agreed-upon set of themes as codes.
- Once the coding was finalized, we calculated intercoder reliability as an additional check to appraise the shared understanding and consistent application of the identified themes by use of the web-based tool ReCal for 2 Coders (Freelon, 2010). We arrived at 95.2 percent agreement (Scott’s π (π) = 0.717, Cohen’s kappa (κ) = 0.719, Krippendorff’s (α) = 0.717) indicating an acceptable rate of agreement between two independent coders.
- The final step was compiling an excel file containing all findings and codes, adding separate columns for relevant criteria per each finding such as such as school type, grade, subject, and Federal state to each finding. This allowed for further quantitative analysis of data, such as determining the distribution of themes across school levels or subjects (see table 2 for results).

A4 (Re-)learning time use and perception for sustainable development in schools – Qualitative results from a self-inquiry based learning intervention

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Abstract

While the relevance of time regarding sustainability is increasingly recognized by researchers, in ESE scholarship and practice, time as a topic of education and time-related learning outcomes remains strongly neglected. In this explorative study, we aimed to find out how time use competence can be fostered within the framework of a school intervention based on the pedagogy of self-inquiry-based learning. We delivered the intervention to 156 students (14-19 years old) from the different types of schools. Applying Action Research, we inquired into students' perceptions of time-related learning experiences resulting from participating in the intervention. Most students experienced the intervention as positive and acquired abilities, helping them to address daily struggles with their time use, often also resulting in less resource-intensive time use. However, the experiential format of the intervention also posed challenges to some students. We also identified broader limitations of intending to foster time use competence through single learning activities. Our results show that school students can learn to organize their own time in a more self-determined and needs-oriented manner. While our approach does not solve more fundamental time-structural problems, it lays the foundation for enabling students to actively participate in the redesign of future time structures.

Introduction

Temporality is an inescapable fact of our existence (Heidegger, 1927). It is an inherent defining characteristic of our being. Life unfolds in temporality. Hale (1993) speaks of time as “the very currency of our being, the flow and continuity of a lifetime’s experience” (p. 89). Without time, there is no experience of existence. And it is through time in which the experienced quality of the lives we live unfolds. Time is also the currency of our actions. We can use this currency for engaging in actions that (potentially) increase or reduce the quality of the time we experience. Similarly, we can use it for actions that are (intend to be) beneficial or detrimental to fellow human beings and the broader animate nature surrounding us. In this sense, time use becomes explicitly relevant for sustainability, as the way we spend our time can have direct impacts on vital earth systems and hence the experience of time of current and future generations.

Environmental and Sustainability Education (ESE) has been described as a “key enabler” (UN, 2017) for achieving a sustainable development. It intervenes in young people’s lives “productively in shaping them in a sustainable manner” (Barth et al., 2015, p. 1) and can equip them with the competencies needed to address the challenges of current unsustainability. Against this background, stimulating the competence to use time in such a way that one’s own needs are met while not jeopardizing the needs of others (living today and in the future), can be considered a primary goal of ESE.

However, while the relevance of time regarding sustainability is increasingly recognized by researchers (e.g., Adam & Groves, 2011; Held, 2001; Seghezze, 2009; Weiser et al., 2017), in ESE scholarship and practice, time as a topic of education and time-related learning outcomes remains strongly neglected (Reheis, 2007; Görtler, 2016; Author(s)).

In this explorative study, we aimed to find out how time use competence can be fostered within the framework of a school intervention based on the pedagogy of self-inquiry-based learning (Author(s)). More precisely, we were guided by the following research questions: In how far do students struggle with their time use and to what extent is time use competence hence something that is useful for their lives? How do school students experience a self-inquiry-based learning intervention targeted at fostering time use competence? What are the limitations of such an intervention regarding its aim to stimulate time use competence? Finally: What are the challenges of applying the intervention, and what are extracurricular factors influencing the conduct of the intervention? We applied action research methodology to address these questions.

Our article is structured as follows: In the next three sections, we provide the theoretical context of our study. More specifically, we (i) elaborate on the relation between time and consumption as a central area of sustainability, (ii) introduce the concept of time use competence as a way of perceiving ESE learning outcomes, and (iii) describe the pedagogy of self-inquiry-based learning (SIBL), constituting the pedagogical foundation for our intervention. Followed by a detailed description of the methodical procedure, we will then describe our empirical findings and link them back to our initial research questions.

Time, sustainability, and consumption

Individual consumption has been repeatedly described as a main contributor to the current environmental and socio-economic threats faced by human society (Alfredsson et al., 2018; Wiedmann et al., 2020). Understanding the drivers leading to individual unsustainable consumption is complex and subject of interdisciplinary research (White, Habib & Hardisty, 2019; Gwozdz, Reisch & Thøgersen, 2020; Verplanken & Orbell, 2022). One explanation for unsustainable behavior that is receiving increasing scholarly interest is to understand current individual consumption as a result of “time scarcity” (Kaufman-Scarborough & Lindquist, 2003, p. 349, see also Jouzi et al., 2021). Time scarcity is less a matter of a lack of time. Rather, it describes a complex interaction between personal and a variety of socio-cultural factors, for instance the constant need to synchronize time across a variety of domains of everyday life, including family, care and domestic duties, work, recreation, and so on (Southerton, 2020). Against this background, sociologist Hartmut Rosa (2011a) describes modern society as “acceleration society”, where technical acceleration is met by societal change and the acceleration of the pace of life, and acceleration is defined as “an increase in quantity per unit of time” (ibid. 2011a, p. 65). This is linked to modern societies’ predominantly quantitative perception of time as a scarce economic resource which needs to be managed efficiently (Adam, 1995; 2002).

In reaction, individuals often employ a variety of “time-saving” technologies and practices, which, paradoxically, may result in increasing the perceived lack of time and thus cause more stress (Reisch, 2001) as well as an increase in energy consumption. An example for the latter is the so-called time-bound rebound effect (Brenčič & Young, 2009) where

individuals used time 'freed' by using household appliances such as microwave and dishwasher to consume electronic media, e.g., TV or video games. Likewise, compensatory consumption, i.e., "the acquisition and use of products in response to a deficit triggered by perceived needs and desires that cannot be fulfilled directly" (Koles et al., 2017, p. 97), has been described as a way to cope with everyday stress (Rosa, 2001b). Correspondingly, time devoted to leisure activities has been found an important factor causing greenhouse gas emissions (Druckman & Gatersleben, 2019; Røpke & Godsessen, 2007).

Against this background, several scholars have argued that changing individuals' perception of time and time use might be a promising intervention for fostering more sustainable individual consumption. One suggestion is the reduction of (paid) work time (Schor, 2005) as this is considered to result in reduced levels of consumption. However, there is evidence showing that a reduction in work time per se will not automatically result in a reduction of energy emissions (Buhl & Acosta, 2016; Wiedenhofer et al., 2018). Instead, there is an important relation between individuals' mindsets regarding sustainability and their decisions how to use their (free) time (Lindsay et al., 2020). Yet, Buhl & Acosta emphasize the importance of the "co-benefits" (2016, p. 275) of increased subjective well-being due to an increase in time wealth. This ties in with research suggesting that a state of "subjective time wealth" (Geiger et al., 2021) or "time affluence" (Kasser & Sheldon, 2009) could enable individuals to use their time in such a way that it has a positive impact on their individual well-being while potentially reducing detrimental impacts caused by unsustainable consumer choices.

Here, the question arises by which means such a goal may be achieved. In recent times, some scholars have suggested time (use) competence as a concept contributing to this goal.

Learning to use time

The term 'time use competence', or simply 'time competence' in itself is not a new one and has been used outside of the sustainability discourse at least since the mid-90s (e.g., Buddrus, 1995; DGfZP, 2005; Freericks, 1996; Hatzelmann & Held, 2015; Hermann, 2009). In contrast to bare time management, which usually refers to "achieving an effective use of time while performing certain goal-directed activities" (Claessens et al., 2007, p. 262), the concept of time use competence emphasizes a reorientation of time use toward people's needs and meanings of life (e.g., DGfZP, 2005; Hermann, 2009). It is claimed that the competence "aims at enabling people to use their time 'consciously'" (DGfZP, 2005, p. 18), meaning that individuals become able to "competently analyze their needs and the conditions of their realization [...]" (ibid., p. 19).

Building upon a needs-oriented understanding of the competence, Galak et al. (2011, 2013) and Reisch (2015) link the concept to the vision of sustainable consumption. For these authors, "temporal consumption competence" (Reisch, 2015, p. 39) refers to the ability to harmonize the relationship between consumption and one's needs in a satisfactory way. According to this position, overconsumption could be countered, for example, by consumers practicing slowing down consumption, thereby consuming less in the same period of time while experiencing consumptive acts as more satisfying.

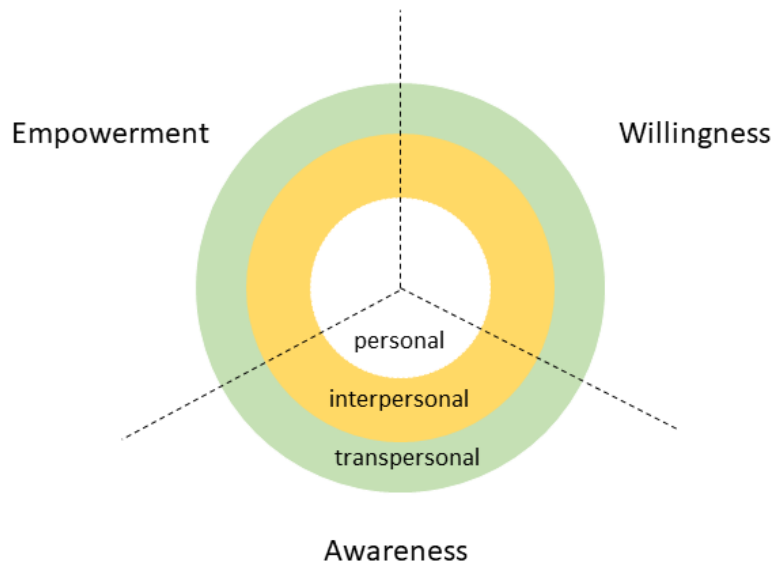
As is characteristic of competencies, educational scholars and practitioners have suggested that such competence is built on a complex interplay of cognitive, bodily, emotional, and volitional skills and abilities (Buddrus, 1995; Freericks, 1996; Held, 2001; Hatzelmann & Held, 2015). For example, time use competence in such a sense requires awareness for the body's own time, one's rhythms, and one's emotions (Freericks, 1996; Hatzelmann & Held, 2015), an awareness for temporal needs of others (Hatzelmann & Held, 2015), as well as awareness for existing temporal structures and objective time processes, such as historical periods, organismic times and cycles, etc. (Buddrus, 1995; Held, 2001; Hermann, 2009).

Furthermore, the authors identify specific abilities that are required to exert time use competence. These include an ability to engage with the present (Buddrus, 1995; Hatzelmann & Held, 2015), self-control and self-regulation (Galak et al., 2011; Reisch, 2015), to structure and plan one's time (Freericks, 1996; Hatzelmann & Held, 2015), a feeling for the 'right' moment (Hatzelmann & Held, 2015), and time empathy (Freericks, Hatzelmann & Held, 2015).

Finally, exerting time use competence presupposes certain volitional dispositions or a certain mindset (Dweck, 1999; 2006), defined as the self-perception or self-theory that people hold about themselves. Proponents of time use competence emphasize that socio-institutional frameworks and temporal structures constrain the personal use of time. However, they also point out that such structural constraints often serve "as alibis for the predominance of habits and biographical imprints, most of which were formed in early childhood" (Buddrus, 1995, p. 89). This is confirmed by research on work-time reduction. Individuals who reduce working hours are more likely to reduce their consumption levels when they already had certain sustainability-relevant mindsets before reducing work-time (Buhl & Acosta, 2016; Lindsay et al., 2020). In contrast, an increase in so-called discretionary time has been found to increase sustainable consumption behavior among individuals who were concerned about climate change (Chai et al., 2015). Against this background, Freericks also emphasizes that time use competence is characterized by "the ability and willingness of the individual to shape the time of life in a self-determined and self-responsible way" (p. 15).

As some of the aforementioned aspects already indicate, time use competence does not exclusively revolve around the individual and the ways they spend their time. The concept explicitly implies an ability to synchronize one's time use with others and their needs, and participate in shaping collective (interpersonal, transpersonal) temporal structures that are sensitive to people's needs (see also Buddrus, 1995; Hermann, 2009; Hatzelmann & Held, 2015). For Reheis (2006), time use competence also implies the ability for "ecological time shaping" (p. 285), that is, shaping time structures that take into account temporal needs for regeneration of oneself, as well as other living beings and ecosystems.

In an attempt to synthesize existing approaches toward time use competence and explicitly link the concept to questions of sustainability, [Author(s)] have defined the term as "the ability and willingness of the individual to spend their lifetime in a self-determined and self-responsible manner and to participate in shaping the social organization of time in such a way that their own need satisfaction and the need satisfaction of others living today and in the future are not jeopardized" (p.10).

Figure 1: Components and dimensions of time use competence

Time use competence in this sense comprises three dimensions (see Figure 1), namely

- (a) a personal dimension, understood as the individual's ability and willingness to spend their lifetime in a self-determined and self-responsible manner in such a way as to ensure the quality of their personal life,
- (b) an interpersonal dimension, which is the ability and willingness to consider the needs of one's immediate social environment in one's conduct of life, and
- (c) a transpersonal dimension, defined as the ability and willingness to take into account the collective needs of present and future generations in one's own use of time.

In sum, the concept of time use competence is supposed to carry a potential for decelerating individuals' subjective experience of time and use it in such a way that it is more contributive to a good quality of life (Reheis, 2006). As in other sustainability-related competence concepts, the creation or enhancement of reflexivity plays a decisive role, enabling the respective actors to act more consciously (Barth et al., 2007; Brundiens et al., 2021; Bieluch et al., 2021). Time use competence provides individuals with an embodied understanding of their needs and their satisfaction. As a result, it might help individuals to avoid overconsumption, allowing them to engage in more deliberate, satisfying, and sustainable ways of consuming (Reisch, 2015).

In recent years, numerous approaches to conceptualizing teaching-learning goals have been formulated in the ESE literature, with the competency concept probably being the most widely received (Vare, 2022). While some consensus seems to be emerging here (Brundiens et al., 2021), research on how competence-based learning processes occur and how competencies can be developed and promoted, on the other hand, is much less consolidated (Lozano et al., 2017). Specifically for time use competence, empirical research on pedagogical approaches aiming to stimulate (facets of) it are completely absent. Consequently, it remains an open question of how pedagogical approaches need to be designed in order to address the (self-)reflexive characteristics of time use and

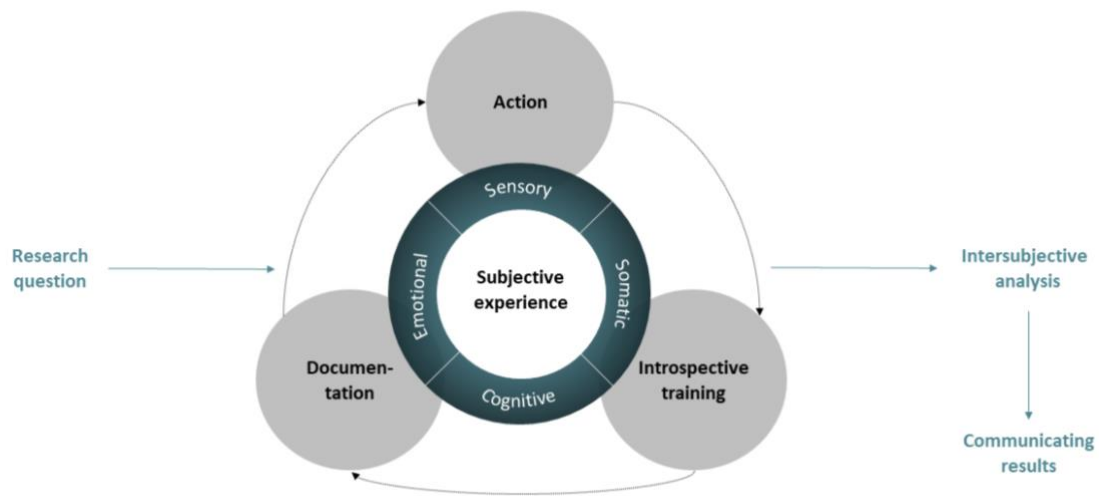
stimulate time-related competence development. The pedagogy of self-inquiry-based learning could be such an approach.

Self-inquiry-based learning (SIBL) is a pedagogical approach in which learners engage in a systematic inquiry of themselves throughout the course of a specific type of action (Author(s)) (see figure 2). SIBL has its theoretical roots in phenomenological education (Kurenkova et al., 2000; Aoki, 2004; Tymieniecka, 2008). Thus, it is predicated upon the assumption that all knowledge is derived from an individual's experience. Phenomenological education aims at investigating and inquiring into phenomena that are consciously experienced, "without theories about their causal explanation and as free as possible from unexamined preconceptions and presuppositions" (Aoki, 2004, p. 90). In contrast to the predominant educational focus on content knowledge and intellectual processes, learners' sensory, somatic, and emotional experiences are of equal importance in phenomenological education. Their inquiry hence constitutes an important characteristic of SIBL.

SIBL also draws upon principles of experiential learning (Kolb, 1984; Kolb & Kolb, 2013) and inquiry-based learning (Huber, 2009). It is experiential learning in the sense that the repeated immersion in a specific type of action (e.g., a change of one's consumer behavior) is a constituent element of SIBL and represents the experience that is inquired into further detail. Moreover, SIBL aims at reflecting this experience in order to reach a more abstract, intersubjectively shared understanding of this experience.

The iterative process of acting and reflecting characterizing experiential learning is now embedded in the inquiry-based learning method, leading to four steps of the learning process (Author(s)): the specification of a research question, the action phase, the analysis, and the communication of the findings. (1) The learning process is initiated by identifying a specific research question (e.g., "what are challenges of changing one's consumer behavior?"). (2) Learners then engage in a specific action that is of concern for the research question and systematically document their personal experiences with this action (for example, through writing reflexive diaries). (3) The action phase is followed by a systematic analysis of the collected data. For this purpose, learners gather in groups and apply scientific analytical methods (e.g., qualitative content analysis, thematic analysis) in order to reach an intersubjective understanding of the data. (4) Finally, the results are presented in the form of written assignments or presentations.

A final constituent characteristic of SIBL is its implementation of introspective training activities. Research has repeatedly emphasized that much about what establishes a subjective experience remains prereflexive (Norretranders, 1998; Wilson, 2004; Vermersch, 2009). Without training, individuals tend to reproduce representations of, and confabulate explanations for, subjective experience instead of accessing the actual experience itself (Wilson, 2004; Johansson et al., 2005; Petitmengin, 2006). More recently, however, consciousness scholars have also shown that it is possible to make individuals aware of previously unconscious aspects of their subjective experience (Petitmengin et al., 2013; Petitmengin et al., 2017), e.g., through mindfulness meditation (Kabat-Zinn, 2005) or micro-phenomenological interviewing (Petitmengin, 2006). SIBL draws upon such activities to systematically deepen and orient the reflection of subjective experience to all of its experiential dimensions.

Figure 2: Elements of self-inquiry-based learning

Frank and Stanzus (2019) suggest that SIBL is a promising pedagogical approach for stimulating intrapersonal sustainability competencies, that is, abilities, proficiencies, or skills related to inner states and processes that can be considered necessary to engage with the cause of sustainability (see also Frank, 2021). More specifically, the authors showed how a SIBL-based university seminar stimulated the cultivation of awareness for inner states and processes, emotional resilience, a connection to and stronger orientation on intrinsic values. Learners reported an overall improvement to their well-being as a result of increased self-awareness, self-care, self-acceptance, and self-compassion (Frank & Stanzus, 2019).

As outlined previously, time use competence explicitly comprises a personal dimension strongly overlapping with intrapersonal sustainability competencies. Furthermore, it is through the development of personal time use competence that individuals become able to spend their time in such a way that it responds to their actual needs, which might reduce the engagement in potentially harmful (consumer) activities.

For these reasons, we used SIBL as the pedagogical basis for a school intervention aiming at stimulating school students' personal time use competence.

Methods

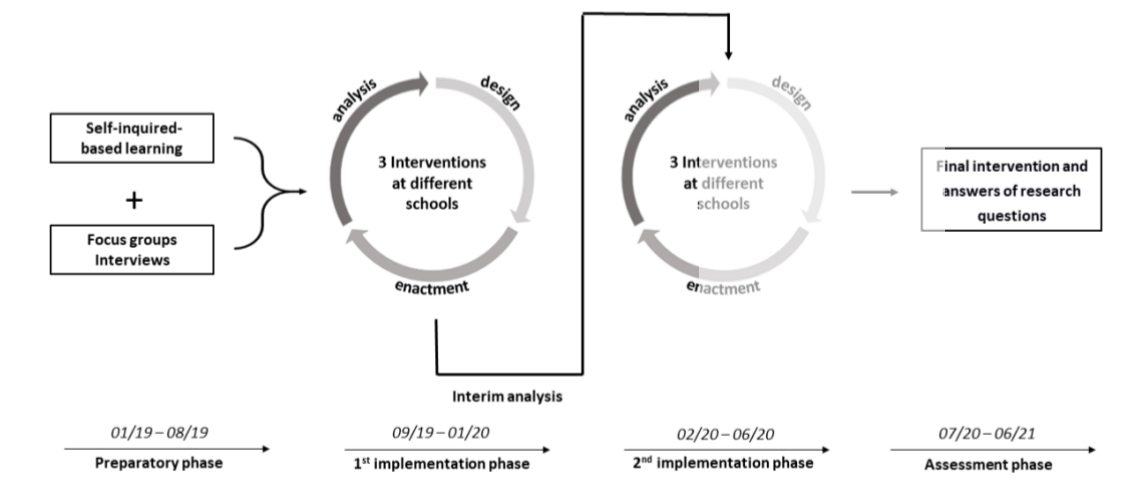
Overall research design

Action research methodology guided the conduct of our study. Tripp (2005) describes action research as „a form of action inquiry that employs recognized research techniques to inform the action taken to improve practice” (p. 4). To achieve this purpose, it foresees continuous cycles of action (enactment), data collection and analysis, and adaptations of the action taken (design). Furthermore, action research describes an emancipatory research approach, empowering those involved in the research process to initiate changes they envisage for themselves and their environment (Salite, 2008; Newton & Burgess, 2016).

Figure 3 provides an overview of the research design. We began our research in January 2019. Three German schools (two secondary schools, one vocational school) were

contacted prior to the inquiry and declared their willingness to participate in the research. As outlined above, self-inquiry-based learning as a means to stimulate (personal) time use competence was a key theoretical construct of our research. In addition, we conducted a preliminary inquiry based on focus groups with teachers and school students from each of the three partner schools to find out about their perceived relevance of a pedagogical approach aiming at stimulating time use competence. Based on theoretical reflection and the preliminary inquiry, a first curriculum of the so-called ReZeitKon intervention was designed.

Figure 3: Action research design of our study



The first implementation phase started from 09/19 in the first school semester. In cooperation with school administrators and teachers, we identified potential cohorts and time slots for our interventions. For both secondary schools, it was decided to offer the interventions to the 9th graders. In the vocational school, the intervention was run with 11th-graders. Each school could provide time slots of 24 hours per school semester, even though these had to be distributed differently due to specific circumstances in each school. In total, three interventions were run in this first implementation phase, addressing school students aged between 14 and 19 years. Participation was mandatory for students, as it was a regular school event. Implementation was accompanied by data collection, analysis, and, if needed, adaptations in the design. The first implementation phase was concluded by a final interim analysis, followed by a workshop in which the preliminary results were discussed with educators, educational researchers, and students. This led to an adapted version of our initial curriculum.

The second iterative implementation phase started in 02/20, with the beginning of the second school semester of 19/20. We collaborated with the same schools and cohorts but worked with different groups. The implementation was interrupted by the COVID-19 pandemic, resulting in nationwide school closures. We tried to continue the intervention with two groups per Zoom, although with a few participants only per group, and, due to the time constraints students faced, a very limited number of meetings and adapted contents (Table 1).

The final analysis of our data was conducted from 07/20 until 06/21. Preliminary results were presented to and critically discussed with practice partners, and their feedback was used to validate and refine our results.

Table 1: *Overview on interventions*

School semester	School	Structure (planned)	Structure (effective)	Number of students
1 st	SecSchool 1	1 x 270 minutes + 12 x 90 minutes	1 x 270 minutes + 11 x 90 minutes	28
	SecSchool 2	15 x 90 minutes	12 x 90 minutes	21
	Vocational school	6 x 240 minutes	6 x 240 minutes	28
2 nd	SecSchool 1	1 x 270 minutes + 12 x 90 minutes	1 x 270 minutes + 2 x 90 minutes (+ 8 x 45 minutes Zoom)	27
	SecSchool 2	15 x 90 minutes	4 x 90 minutes	24
	Vocational school	6 x 240 minutes	4 x 240 minutes (+ 3 x 45 minutes Zoom)	28

Intervention

The intervention was based on the principles of SIBL. The heart of the intervention was a transformational project of the school students' time use, which they could freely choose and specify (e.g., more sleep, reduced use of electronic devices). It was not necessary that the transformational project was successful, as it is the experience unfolding while attempting to change one's time use that pedagogically matters. In order to make this experience subject to reflection and research, students were supposed to document their personal experiences in the form of time use documentations, diaries, and peer conversations.

Each session foresaw brief mindfulness practices in the beginning, theoretical input on topics like needs, values, and the concept of time, and corresponding practical exercises. The project phase was preceded by a few introductory sessions familiarizing learners with the topic of time (e.g., group reflections on what time means, exercises in which learners experienced how different activities are experienced differently regarding their duration) (see Grauer et al., 2021, for a detailed overview of the applied learning activities). At the end of the intervention, participants would gather in groups, analyze their experiences with regard to challenges and supporting factors of changing one's time use, and present their findings. In addition, they would write individual reflections on their experiences with changing their time use. The specific structures of the interventions were adapted to the particular circumstances at each school (see table 1) (see Appendix 1 for the full curriculum).

The interventions were conducted by two of the authors of the paper, who were also responsible for developing and researching the intervention. School teachers were present during the individual sessions, without however actively intervening in the teaching process.

Data collection

We triangulated different types of data that were collected at different stages of the intervention. Table 2 provides an overview of the type and total quantity of data and sorts them in chronological order of their collection: (1) In the beginning of our intervention, we handed out a form to the students in which they were asked questions about their understanding of school and the responsibility for the learning processes (Appendix 2). (2) Students wrote time use documentations in order to track their personal time use (Appendix 3). (3) Interim evaluations were conducted for each intervention after half of the program was completed (see Appendix 4 for the questionnaire). (4) In one school, a homeroom teacher integrated an interim reflection on the intervention experience in a written assignment and made students' anonymized interim reflections available to the research team. These were also included in the data analysis. (5) In the final quartile of the program, we conducted semi-structured interviews with students of each cohort on their experience with the intervention. Participants were randomly selected and interviewed by a student assistant trained in this data collection method (see Appendix 5 for the interview guide). (6) For the last session, students were asked to prepare final poster presentations in groups, sharing their concluding insights from the transformational projects they pursued throughout the intervention. (7) Students (in groups) also provided final feedback on their intervention experiences as posters. (8) Finally, in addition to the final group presentations, students wrote reflexive reports in which they described their intervention experience and their learnings resulting from the transformational project in more detail (see Appendix 6 for the template).

We had obtained forms of consent from caretakers of all students whose data we used for our study prior to the implementation. As Table 2 indicates, not all (caretakers of) students provided their data for further analysis. Since forms of consent were collected at the beginning of each intervention, however, this restriction does not cause a bias in the overall data.

Table 2: *Type of data (including used abbreviation in results section)*

No.	Type of Data	Quantity
1	Questionnaire 'school and learning'	46
2	Time use documentations	32
3	Interim evaluations (IE)	43
4	Learning reflections	25
5	Semi-structured interviews (Iview)	11
6	Final presentations	15
7	Final student feedback	4
8	Reflexive reports (RR)	31

Data analysis

We combined elements of conventional and directed qualitative content analysis (QCA) for data analysis (Hsieh & Shannon, 2005; Schreier, 2014). Our analysis was primarily based on an inductive coding approach, that is, we derived our results as close as possible from the actual text data. Nevertheless, our analysis was also directed insofar as we made use of the concept of time shaping competence for structuring and interpreting parts of the responses provided by the students on their learning experiences (deductive coding). Our analysis primarily focused on the identification of reoccurring patterns and schemes, so that we limited quantifications to selected data material that was either already quantitative (time use documentations) or representative (final presentations).

Our procedure followed a collaborative coding approach (Cascio et al., 2019). The core coding team consisted of two student assistants experienced with QCA and a research fellow, holding more than six years of experience applying QCA and other qualitative methods. The team began the analysis process by familiarizing themselves with the data and selecting relevant passages according to the research questions. These also constituted the main categories for the coding process. This was followed by an open and axial coding process which involved the discussion of codes throughout weekly meetings with the team which were attended by a second research fellow involved in the project, for the purpose of peer debriefing (Flick, 2007). Codes were discussed until mutual consensus was reached, eventually leading to a preliminary codebook. Next, each team member individually continued to code the entire data material, with weekly meetings held to guarantee consensus among the research team throughout the entire process. Interim findings were also presented to teachers (partly present during the interventions) for purposes of member check and external validation of the findings (Flick, 2007).

The entire data analysis was rooted in an interpretative-critical paradigm. On the one hand, it aimed at reconstructing and making sense of the school students' reports about their subjective experience with the intervention; on the other hand, we shared the assumption that the way school students thought and spoke about the contents of the intervention would also influence how they constructed (the meaning of) their experiences. This way, the QCA was also influenced by an attitude of discourse analysis (Schreier, 2012).

Results

In accordance with our research questions, the data material was grouped in four main codes, namely (1) school students general time use and experience, (2) experiencing the intervention and the corresponding learning process, (3) perceived limitations, and (4) challenges to and extracurricular factors influencing the intervention.

School students' general time use and experience

In a first step, we analyzed the data material with regard to what it revealed about school students' general experience and use of time. Here, especially the students' time use documentation provided insights into their main daily activities. Following Giurge et al. (2021), we clustered students' time use according to the main categories 'school &

schoolwork', 'necessities', and 'overall leisure' plus a category for transportation (Table 3). School and schoolwork take up a large part of everybody's daily time, in average students spent almost six hours a day for attending school plus an additional two hours for homework and studying. Necessities included activities like sleeping, eating, or daily hygiene, making up for another significant part of students' everyday time use. In line with a representative survey studying German school students' time use (MPFS, 2019), sports/physical exercise, watching TV, and smartphone use constituted the most frequently mentioned leisure activities, followed by video games and meeting friends. Twelve students reported spending almost an hour daily using transportation. The overview indicates that students spend a significant amount of time pursuing activities that can be considered energy intensive.

Table 3: *Students' average time use per day*

Activity	Duration (in minutes)
School and schoolwork	
Class attendance	351
Homework/studying	134
Necessities	
Sleeping	363
Eating	40
Daily hygiene	28
Cooking	63
Taking care of a pet	37
Overall leisure	
Sports/exercise	96
Watching TV/streaming	153
Smartphone use	118
Playing video games	87
Spending time with friends	226
Other (learning) activities (piano lessons, driving lessons)	13
Reading	88
Transportation	64

Note: Number of respondents indicated the number of students who mentioned the corresponding activities in their time use documentations. The duration indicates the average time spent per activity across all available documents.

Most students expressed some form of struggle related to their experience of time. More specifically, students expressed (1) a feeling of "wasting" their time, (2) the impression that one's time use was determined by others, and (3) a feeling of stress. Concerning the first, students felt they would often spend their time doing things they did not consider meaningful, instead of pursuing activities they considered important. This often referred to watching TV or using mobile phones:

“I often notice that the time could be used much more meaningfully for other things. You unintentionally spend a lot of time on your cell phone, even though you wonder what you were doing during that time.” RR_S1_13

Students also frequently reported occasions at which they perceived their time as determined by others. While they mentioned various activities they did not engage in fully voluntarily (cleaning up the room, taking care of siblings, sports training), school-related activities were particularly perceived as other-determined:

“You basically have no choice but just sit there and have to do what the teacher says” lview_S1_1

This perspective was also reflected in responses to the questionnaire on ‘school and learning’. On a scale from 1 (fully other-determined) to 10 (fully self-determined), the average degree of perceived self-determination concerning school-related time use was $M=5,65$ ($SD=2,7$; $N=43$), with nearly half (20) of the students scoring 5 or below.

The experience of stress was the third most frequently mentioned struggle concerning students’ time experience with school-related tasks the main source of stress. Yet, some students’ daily lives seemed to be very busy overall. As a consequence, they stated that they often lack time to pursue other activities they consider valuable, including those related to basic needs. In the following quote, for example, a student explains why she doesn’t sleep enough:

“I don’t have a lot of leeway in organizing my time. My day is usually very well planned. I play field hockey as a competitive sport and that takes up a lot of time. Because it is competitive sport, I cannot simply skip the training [...]. And that’s my biggest stress factor right now.” RR_S2_5

The change projects students pursued throughout the interventions reflect their most common forms of struggles related to time experience (Table 4): Establishing a homework routine, reduce procrastinating, and getting more sleep were the topics most chosen for projects. In their reflective reports, students elaborated how they were interested in determining whether more regular patterns would translate into reducing the kinds of stress they experienced regularly. Another topic students explored was the reduction of screen time, related to either using the “free” time for homework or in order to spend more time with hobbies. Exercising more regularly was another project, as was following a healthier diet for a limited amount of time.

In summary, our findings confirm the relevance of a time-focused intervention for school students. They expressed explicit struggles with their time experience, either directly affecting their perceived quality of life or indirectly restricting their ability to care for themselves (i.e., addressing their needs).

Table 4: Overview of change projects

Type of time use	Project
School	Reducing procrastination Dedicating daily time for homework and learning
Necessities	More sleep Healthier diet (conscious eating, less sugar, only drinking water) Spending daily time for tidying up
Leisure	Reducing use of screentime/social media Replacing screen time by creative activities Exercising more regularly Daily meditation
Other	Overcome anxieties Being “productive” for 24 hours

Experiencing the intervention

A particular interest of our study was to find out how school students experienced the intervention and how it (reportedly) affected their overall experience and use of time. We distinguished between students’ overall experience of the intervention and the single learning activities it consisted of.

Overall, the majority of students expressed positive sentiments about the ReZeitKon intervention (negative feedback and difficulties are reflected in the following sub-section). Most common statements by students describe the intervention as positively different from usual school lectures and were satisfied with their overall experience of partaking in the intervention. They considered the intervention interesting and expressed a wish for more offers of this kind in school:

*“I: Do you think it makes sense in general for such offers to be made in schools?
S: I find it useful. Because it’s better. Because then you learn something else apart from doing school assignments, practical things for life. time is valuable. [...] What good is biology now? Or health sciences when I play around with a heart and I’ll never do that again in my life anyway? So I actually really liked it.”
Iview_S3_1*

Students also commended the relaxing atmosphere appreciated the experiential learning activities in the seminar:

*“So [the] activations .. I really liked that you could sometimes feel that they had a meaning. Sometimes you didn’t understand the meaning at first, but afterwards you understood the meaning more and more often and how things affect you. And I liked the psychological things, for example, that if you move or and don’t speak or sit around and do nothing that you always perceive time differently.”
Iview_S1_2*

Among the range of specific learning activities offered throughout the intervention, some were repeatedly highlighted by students in their feedbacks, most often these were short introductory meditations and yoga exercises:

“The meditation makes you relaxed and for a short moment you forget the stress that will follow for the rest of the day. When we did yoga I felt a little

uncomfortable, but that would go away with regular repetition and I would be able to fully engage with the exercises and the here and now.” RR_S1_7

Students also appreciated the contents related to personal needs and their satisfaction, such as the *needs couch* (compare Grauer et al., 2021), as well as experiencing how time seems to pass with different speed depending on activities carried out:

“What stuck out to me was [...] that we could just see how quickly time can go by and how slowly time can also go by and that’s why I actually found that the best thing overall.” lview_S3_4

As a result of their participation in the intervention, students reported several learning experiences that can be associated with the concept of time use competence. At the awareness dimension, reported learnings included (i) an overall improved awareness for one’s time use, (ii) an awareness for one’s unsatisfactory use of time (“wasting time”) and the importance to consider time as a valuable resource, (iii) a better understanding of one’s needs and how to satisfy them, (iv) a better feeling for one’s one temporal rhythms and needs (e.g., the best time to accomplish school tasks, how long one needs to accomplish a task), (v) a better connections to events in there here-and-now, including one’s own bodily sensations, (vi) an increased awareness for the subjectively experienced impacts of one’s time use.

Students also developed practical abilities, enabling them to spend their time in a satisfactory way. More specifically, students (i) developed daily and weekly schedules to organize their time (ii) built a social support network (e.g., pursuing projects in groups, asking people to remind them of their projects), (iii) monitored their daily time use, (iv) divided specific tasks in manageable sub-tasks, (v) listened to their momentary and temporal needs and structured their days accordingly, (vi) reminded themselves of their motivations underlying specific activities and set priorities based on their values, (vii) offered themselves rewards when accomplishing difficult tasks, (viii) could better estimate the duration of tasks and hence organize their day accordingly, (ix) put distractions (e.g. smart phones) aside helping them to concentrate on specific tasks they wanted to accomplish, (x) and learned relaxation and concentration techniques they could integrate in their daily lives. Finally, (xi) one student developed his own technique called the “five minutes method”:

During my project I discovered a trick that will help me a lot in the future. I like playing video games very much. every time I want to stop playing, I tell myself: 5 more minutes. [...] My biggest problem with my homework or studying was always that I couldn’t start [...]. Now I always said to myself before I started, “I’m going to do this for five minutes and then just stop, regardless of whether I’m done or not.” This little trick meant that five minutes easily turned into an hour, and I even did three hours of chemistry in one day (which is also reflected in my chemistry grade).” RR_S2_2

Students experienced several changes on the willingness dimension, too. Two types of changes can be distinguished, namely (a) reflections and changes of the intentions underlying time use, and (b) changes in the mindset underlying time use. Concerning the first, students repeatedly expressed that the intervention made them aware of their unsatisfactory use of time and nourished their intention to avoid wasting their time in the future. The intention not to waste time does not necessarily mean that students want to be more efficient (although they sometimes might, see next sub-section). Instead, students started considering their time as a valuable resource, which they try to spend

in a more meaningful, satisfactory way. While this might include the determined completion of a task, it can also mean, as one student holds,

“Not to use my time efficiently, but rather to be content with my time.” Iview_S1_2

Concerning the second type of change, students developed a higher sense of self-confidence and self-determination in relation to their time use. These changes thus offer insights into the possibility of choice, that is, they enable students to develop a sense of agency related to their experience of time and the way time is spent:

“I also realized how many things I do involuntarily, just because it’s ‘mandatory’.” RR_S1_6

“During my project I noticed that I am much more willing to work if I do something voluntarily and of my own free will. So learning didn’t feel like work, but more like a video game that you really want to play.” RR_S2_2

Both as a consequence of this insight and as a result of the acquired abilities, students also felt more confident in terms of mastering difficult times:

“My use of time has definitely changed in some situations. When I have to study for an exam, like I did recently, and the subjects seem to be overwhelming, I know that I’m able to get a lot done in a day if I really have to.” RR_S2_7

Finally, students reported direct effects of the intervention on their time use. They described their current time use as more conscious, meaningful, and satisfying, and reflected more on how they want to spend their time. They also reported being able to organize their daily tasks more efficiently in order to find time for desired activities, such as spending time with friends or dedicate quality time to themselves:

“During weekends I no longer worry that I won’t be able to do all my homework, but I can also take a little more time for myself. I hence experience the time much more intensively and can devote myself more to the now.” RR_S1_5

Moreover, based on the final reports submitted by students, 24 out of 31 students successfully completed their change projects, and planned to maintain the changes they implemented beyond the intervention. Concerning these projects, it is worth mentioning that students intrinsically moved toward a form of time use that can be considered more sustainable. Wherever relevant, students pursued projects that reduced the negative environmental impact of their actions (e.g., less sugary products, only drinking water, less meat, reducing the use of electronic devices) while aiming at increasing personal health benefits (more sleep, healthier food choices).

Perceived limitations

Albeit overall positive feedback and manifold reported learning experiences, students also expressed criticism toward the intervention.

We identified students in each cohort who stated they did not learn anything from participating in the ReZeitKon intervention. While the absence of experienced learnings can often be explained by non-curricula factors (see next section), some students explicitly expressed (partial) dissatisfaction with the intervention. Especially the first cohort complained that both the purpose of the intervention and singular learning activities was not always clear, which was partly due to the experiential approach chosen for the intervention:

“It wasn’t that bad[.]... you kind of see it, I would say, but sometimes I wished for more clarity, yes.” lview_S3_3

“I imagined the course [...] to be something like this, but some tasks surprised me a lot, because I either didn’t understand the meaning at this point or it was very strange.” (RR_S3_7)

A few students also described parts of the intervention as boring, although this experience was usually associated with the written documentation of their time use. One student did not see any value in the intervention, complaining that “they lost content of the other subjects” (lview I_2) and would rather have used the time to prepare for these.

Students particularly struggled with regularly documenting their time use. Apart from having to fill these out at home and complaining about additional homework, some students experienced this task as exhausting and did not understand the value of closely monitoring how they spent their time and reflecting on the needs underlying their time use.

Students’ reports also - directly or indirectly - revealed important limitations in terms of the envisaged learning outcomes of the intervention.

In general, the pedagogical approach underlying the intervention was not (fully) comprehensible for some students. These students expected theoretical lectures or specific instructions on improving their time use. In line with these expectations, they also considered their change project as something where they had to perform (in the sense an ‘other-determined’ way of time use) instead of an opportunity for reflection:

“If I didn’t carry out my project [of sleeping 10 hours a day], it’s mostly due to insomnia or stress. [...] I also had to completely change my schedule [...]. I’m usually used to working until 9 pm some days, eating afterwards and going to bed around 9:30 or 10 pm. Because of my project, I couldn’t finish many things and had to postpone them to the next day, which was sometimes annoying and exhausting. For these reasons alone, it became clear to me at the beginning of the project that the project had no place in the normal everyday stress of school.” RR_S1_3

Another limitation concerns the transfer of the contents and practices of the intervention to the students’ actual time use, even though they generally acknowledged the importance of such kind of learning offer:

“I know it’s necessary [to learn about one’s time use], but I still don’t really realize that it’s necessary for me. Although I think that it is (laughs)” lview_S3_3

In terms of students’ time use competence development, limitations can be found alongside all dimensions of the concept when analyzing the way students speak about their time use. Concerning the awareness dimension, students’ time use documentation particularly demonstrates difficulties in engaging with the momentary lived experience: Instead of identifying, identifying specific motivations for acting, and observing how specific acts affected their moods, students provided generic responses to the questions that did not contain information on the specific lived situation (Table 5).

Table 5: *Examples of generic descriptions of drivers and impacts of specific activities*

Activity	Duration	Motivation	What does the action do?	How do you feel afterwards?
Washing myself	30 minutes	Hygiene	Clean and groomed	Good
Sleeping	8 hours	Tired	Relaxes me / revitalizing	Mostly still tired
Football match	2 hours	Body and because I don't want to disappoint my team	Different, depending on how I play	Different, depending on how I play

Similarly, students sometimes evaluated specific learning activities based on the sensation that it prompted (particularly boredom), although it was the explicit purpose of the exercise to observe and recognize such sensations.

Regarding the ability dimension, learning limitations became particular salient throughout the execution of students' change projects. As the quote above highlights, not all students succeeded in pursuing their time change projects, often surrendering to those challenges the project was meant to address (e.g., dealing with stress). While it was not necessary to succeed in the transformative projects, the pedagogical aim of deepening one's reflection and understanding of the challenges keeping one from pursuing the intended change was not always reached either. For example, one student stated as one reason she did not pursue her project of sleeping more regularly:

*"I'm often distracted and in general time was too short to put this into practice."
Iview_S2_2*

A repeatedly occurring obstacle we identified in the data lay in the students' feeling of being other-determined in their time use and hence their inability to change the latter, even though they understood how their daily schedule causes stress in their lives:

"Unfortunately, doing more sports didn't work. I didn't have time for it because I had to study a lot and lots of other things to do." RR_S3_4

These quotes underline limitations of the intervention regarding its intention to stimulate volitional dispositions for a self-determined time use. Another manifestation of this limitation is some students' aim of an increase in efficiency and productivity through changing their time use. For example, one student pursued the goal of "being productive for 24 hours" (RR_S2_7). While the search for productivity is not undesirable per se, students expressing this motivation did not show any signs of reflecting or questioning this goal in relation to their underlying needs and their well-being.

Extracurricular factors influencing the intervention

As indicated, several extracurricular factors influenced the intervention and posed challenges in working towards the envisaged learning objectives.

First, students held ideas about learning and school lessons, as well as resulting expectations toward the intervention that co-determined their degree of engagement and

evaluation of the intervention. For example, some students thought it was the teachers' responsibility to "explain how to implement plans and find the motivation to do so" (IE_S3_3). The experiential approach chosen for the intervention did not provide these explanations, which could lead to dissatisfaction. More generally, students commonly conceived of themselves as mere recipients of existing knowledge and contents of specific intervention sessions. When asking students about their opportunity to actively co-shape lessons and deciding on their learning contents, 30 out of 48 students responded they had no such possibility and considered the teacher exclusively responsible for the classes.

Second, the specific group constellations influenced the intervention experience. While two interventions took place within regular class groups, the participants of the third came from different classes, and only met once a week during the intervention. Moreover, the gender ration in this group was highly unbalanced, with five females in comparison to 23 males, causing social dynamics that might have influenced the actual learning process. Another factor that might have influenced the implementation is the fact that a teacher from the respective school was present during most of the sessions. Their presence not only influenced the class dynamics, but also that not all students in the latter cohort were equally familiar with the teacher present during implementation, which may have also affected their willingness to participate in the intervention:

"No [additional] teachers should be present, or it should at least be the class teacher or liaison teacher" (IE_S3_3).

The personal relation to the two facilitators who were responsible for implementing the intervention was univocally described as positive.

Third, and partly because of the class constellation, the working atmosphere was a central factor determining the overall course and learning experiences. This turned out to be an important challenge for the first cohort:

"The sessions went pretty chaotic because we had many disturbing factors"
RR_S2_5

"There were many good ideas and approaches in the course, which unfortunately often could not be implemented (due to class behavior)." RR_S2_1

Fourth, and directly contributing to the working atmosphere, the overall schedule of the intervention impacted the conduct of the intervention (yet could not be arranged differently). Again, this turned out to be particularly problematic for the first cohort, where the intervention took place in the afternoon, after six hours of schooling. However, the schedule also complicated the implementation of the intervention in the vocational school. Here, the intervention was offered in six blocks à 4 hours, with several weeks in between each block. Consequently, some students lost sight of the intervention and its associated learning activities, often impeding the preparatory work for the upcoming session.

"It was a bit confusing whether we had normal school or not. Sometimes it really happened that we were meant to have this [the intervention] but then we didn't have it." Iview_S3_3

Fifth, the intervention was of different importance in the schools. While in one school, students' final reports at the end of the semester were graded by the teacher present

during the intervention, no evaluation took place for the other interventions. While some students appreciated the absence of pressure, the absence of extrinsic motivation resulted in other students not engaging in learning activities on a regular basis, especially those suggested as homework such as documenting their time use. At the same time, the intervention partly replaced regular subjects. Not only would this lower the intervention's priority during exam phases, it also caused occasional frustration, as students were afraid they would miss out on curricular content relevant for later exams

Sixth, students were not as familiar with their schools' digital infrastructure as expected. The infrastructure (e.g., cloud systems) was meant to facilitate the learning process (by uploading material, sharing exercises, communicating with students). However, even though each school had a (different) learning platform, many of the students had not been using it at all, or at least regularly at the time of intervention, and thus did not receive relevant information about specific tasks or materials necessary to accomplish these which were provided online.

Discussion

Time perception has been considered an important cause of individual unsustainable behavior. Scholars have argued that in Western societies, individuals increasingly experience time as scarce, leading to diminished well-being, accompanied by an increased time efficient consumption and use of time-saving technologies (Gärling et al., 2014; Geiger et al., 2021; Whillans et al., 2017). Educational settings are thought to carry a potential to counteract these tendencies (Campbell & Timmerman, 2007; Pacini-Ketchabaw & Kummen, 2016; Shahjahan, 2015), and the concept of time use competence has been suggested to describe the corresponding learning outcomes (Author(s)). So far, however, time remains a neglected topic in school education (Grauer et al., 2022), and empirical research on pedagogical approaches enabling individuals to relate to their time in a more deliberate, self-determined way remains almost absent.

In this study, we explored the potential of a self-inquiry-based school intervention to foster (personal) time use competence among school students. Students reported several learning experiences that can be associated with the concept of time use competence. More specifically, they mentioned an increased awareness of their time perception, time use, and time-related needs, developed skills enabling them to spend their time in a satisfactory way, and felt more self-determined in their time use. As a consequence, students reported several direct and lasting effects on their time use, overall feeling able to better respond to (some of) the time-related struggles they had faced, and experiencing their time as more conscious, meaningful, and satisfying. Strikingly, students primarily made use of their acquired time use competence to manage school-related tasks more efficiently and engage in self-care activities (sleeping, better food, time for oneself and friends). At the same time, they reduced such activities associated with the use of goods and services (television, smartphone) with activities that required little or no consumption (e.g., drinking only tap water, spending time in nature). These findings support the hypothesis that fostering (personal) time use competence can indeed reconcile personal well-being and need satisfaction with more sustainable consumption choices (Galak et al. 2011, 2013; Reheis, 2006; Reisch, 2015).

We think that many of the limitations we faced and the extracurricular factors influencing the intervention can be mitigated in further design iterations. For example, students'

difficulties with understanding the overall purpose of the intervention might be addressed by more thoroughly introducing the program and its pedagogical approach in the beginning. Similarly, specific learning activities can be improved. The outlined challenges with documenting their time use, for example, might be overcome by providing closer guidance and step-by-step explanations of the task, or the mindfulness exercises can be more closely adapted to the target group (Emerson et al., 2019). We had partly started to implement such changes for the second circle of our intervention yet could not conclusively evaluate its perception because of the school closures in the context of the Covid-19 pandemic.

The results thus show that the abilities and willingness needed for sustainable time use, which were at least partially stimulated through the intervention, go well beyond what is currently taught on the topic of ‘time’ in German formal education curricula (Author(s)) or represented in relevant learning goal conceptions of ESE (e.g., de Haan, 2006; Brundiers et al., 2021).

However, in addition to these potentials and possible improvements, our study also points to more fundamental limitations of fostering time use competence in the form of an intervention as ours. A central such limitation is that our efforts to empower students to use their time in a competent and self-determined way took place within the established time regime of formal schooling. Un-learning and re-learning the use of time in school is inevitably a creative process of questioning existing patterns of behavior, reflecting on one’s own needs and those of others, and experimenting with new practices. For such creative processes, conducive conditions are those that allow for flexible use of space and time and high degrees of learner autonomy (Davies et al., 2013) - characteristics that do not usually apply to the normal school day. Being embedded in a formal education setting, the intervention goals of encouraging needs-based time use practices encountered administrative and organizational frameworks that offered very limited degrees of freedom and could be considered rather restrictive in terms of their ability to re-negotiate established structures, for example with regards to the choice of subject matters (*what* students want to engage with), durations and types of learning activities (*when* and *how*), place or setting of learning (*where*) etc. Teaching time use competence under such conditions inevitably runs the risk of becoming contradictory, as Immanuel Kant (1803) pointed out when he asked: “How do I cultivate freedom in the face of coercion?”. Fostering time use competence in formal schooling then indeed becomes an oxymoron and a paradox at the same time: an oxymoron insofar as it encourages autonomy (to use time based on one’s needs) and conformity (to use time based on institutional rules) (Maddock, 1998), and a paradox insofar as the practice of teaching time use in compulsory education becomes a practice that pursues its own abolition, in the moment that students have attained maturity to use their time independently (Schluß, 2007). Students are well aware of these contradictions and also challenge and problematize these tensions - as certainly also happened in the intervention.

But how can harmful effects of the tensions between teaching-learning processes on the micro-level, which are geared towards enabling needs-oriented time use, and the prescriptive time structures of the educational institution be mitigated, or even used productively? For teachers, one way out could be to raise awareness of experiences of these contradictions and to make them subject to teaching and learning processes by

exploring and discussing them (Vare, 2020). The insights gained in this way can lend a closer look at how time is used and managed in school settings. This, in turn, can give rise to impulses for school development processes aimed at making schools as educational organization as a whole more sustainable (Rauch, 2002; Wals & Benavot, 2017). If time use is understood not only as the institutional pace of teaching students, but as a resource for sustainable need fulfillment, then additional, more or less visible areas of school and school culture come to the surface (Author(s)); for example, how time use is addressed in different subjects and managed in participation and communication processes, or what significance competent time management has for the gratification/selection function of school (grading, assessment), which students perceive as an indicator of 'what really counts' (Barth et al., 2012). Looking at school time culture would not only highlight tensions between the individual school (meso level) as an environment of time-related teaching-learning processes (micro level); it would also look at the restrictions and leeway schools have when they respond as an organization to external specifications (macro level) and interpret them into educational practice. Whole school approaches, now well tested in ESE and named as a priority area in UNESCO's ESD for 2030 agenda, arguably offer much potential for this (UNESCO, 2020).

Limitations

We distinguish limitations concerning the pedagogical approach from the methodological aspects of our study.

Concerning the pedagogical approach, we have already touched upon the fact that our intervention did not involve broader school structures. It addresses one group of individuals at a time instead of taking a whole school approach (Hargreaves, 2008), hence missing out several other access points that would allow for a more fundamental transformation of how time is dealt with in the schools we have worked with. It might also be argued that focusing on individual time use to foster more sustainable consumption patterns is even morally questionable, as it responsabilizes the individual instead of changing the broader cultural, socio-economic, and political drivers that co-determine individuals' time use and perception and, in consequence, their individual consumption (Herrmann, 2009; Soneryd & Ugglå, 2015).

Concerning the first aspect, it must be taken into account that German public schools are bound to the broader federal school system that foresees mandatory schooling and prescribes specific contents schools have to cover. More fundamental changes, as for example envisaged in a whole institution approach, must also be approved by school authorities, which makes such their realization complicated within the framework of a time restricted research project. As such, this limitation of our research project might reflect a more general limitation of conducting time-related action research within the German school system.

Concerning the second aspect, we think that an individual capacity building is not in conflict with recognizing broader cultural, socio-economic, or political deficiencies. While addressing the latter is important, we think that it is equally important to sensitize learners for their own time use and its underlying needs and values, as well as to develop a sense of self-efficacy and self-determination regarding their individual time. It describes what Thiermann and Sheate (2020) have described as an experiential strategy, aiming to

“physically, cognitively, and affectively stimulate meaningful experiences in relation to oneself” (p. 7) and one’s social and environmental surroundings. It is out of such an embodied understanding of concepts such as values and needs, and an embodied knowledge about how to satisfy one’s needs, that individuals can develop alternative ways of spending their time, and, eventually, co-shaping social structures that also allow other people to adequately respond to their own needs.

Methodically, a major limitation of our study is its strong reliance on students’ self-reports. While these constitute an important source for understanding their subjective experience of the intervention, especially in the given context, there is reason to doubt in their (full) authenticity. Most of the material used for data analysis, for example, has been a mandatory task in class. Some materials have even been examined by school teachers, making the material prone to fulfilling anticipated expectations. Interviews also carry inherent limitations as a source for understanding people’s motivations to act (or using their time) (Small & Cook, 2021), so that the interviews must be interpreted with some caution, too. Future studies of this kind could, for example, complement first-person data with teachers’ and parents’ perspectives in order to evaluate students’ time-related learning and changes of their time use.

Conclusion

In times of global multiple crises, new ways of enabling individuals to engage with the cause of sustainability are needed ever than more. Fostering individuals time use competence has been lately considered being such a way. In our study, we looked at the potential of a self-inquiry-learning intervention to foster this competence among school students.

The majority of our participants confirmed time-related struggles that also manifested in unsustainable consumer behaviors. Our intervention offered learning spaces helping most of the students to deal with these struggles. Not only did students express a different perception of their time. The intervention also led to a fundamental reorientation of one’s own time use towards one’s own values and needs. The participants also acquired specific methods enabling them to align their own time use more closely to their own needs, also partially resulting in more sustainable actions. Our results show that school students can learn to organize their own time in a more self-determined and needs-oriented manner despite - or perhaps because of - the high burden of tight timetables. While our approach does not solve more fundamental time-structural problems in contemporary society, it is a precondition for enabling students to actively participate in the redesign of future time structures.

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A5 Learning to spend time in unusual times — An inquiry into the potential for sustainability learning during COVID-19-induced school closures

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Abstract

While current research on school closures during the COVID-19 pandemic is predominantly concerned with learning deficits, our exploratory study focuses on the previously neglected question of young people's concrete learning experiences during this disruptive period, with a focus on their time-spending and consumption behaviour. For this purpose, we interviewed German secondary school students via Zoom and used a grounded theory approach and a transformative learning theory framework to derive recommendations for environmental and sustainability education (ESE). Our findings highlight two important insights: first, that the fixation on academic learning loss obscures the view of student learning; and second, that real-world experiments such as the involuntary school closures during the pandemic have the potential to start meaningful, transformative learning processes and experimentation with new strategies for needs satisfaction.

Introduction

When in March 2020, measures were taken in most countries around the globe to contain the spread of the Coronavirus SARS-CoV-2 pandemic (hereafter COVID-19) sustainability researchers describes this a “window of opportunity” (Bodenheimer & Leidenberger, 2020, S. 61). Declining levels of carbon emissions caused by decreases in mobility and industrial production combined with swift action by authorities in response to the pandemic fuelled hopes that the COVID-19 crisis were considered a turning point for future action against climate change (Markard & Rosenbloom, 2020). Education researchers and practitioners, too, were quick to advocate using the pandemic as an opportunity to accelerate long overdue education reforms (Ng, 2021; Sahlberg, 2020). This was reinforced by the Environmental and Sustainability Education (ESE) community, highlighting how the pandemic might function as a catalyst for mainstreaming ESE into educational practice (Bai, 2020; Ebersohn, 2020; Kollek, 2020; Wolff, 2020).

Research on students' learning experiences during the pandemic to date mostly seems to focus on deficits in their academic performance (Andrew et al., 2020; Engzell et al., 2021). Considerably few studies seem to inquire into whether or which kinds of learning experiences students underwent during this challenging time. The present study addresses this gap by exploring German students' time-use experiences during school closures between 2020 and 2021. It connects to existing research on the relevance of individual time use in relation to sustainability (Grauer et al., 2022; Jouzi et al., 2021) and was guided by the following research questions: How did students experience school closures during the COVID-19 pandemic? What contextual factors contributed to these experiences, and what transformative learning processes related to time use and sustainable consumption can be identified in them?

During our analysis, we came to understand the pandemic as a “disorienting dilemma” (Eschenbacher & Fleming, 2020; Velasco et al., 2021), allowing us to interpret our findings from a transformative learning perspective. In the following, we will thus first introduce relevant theoretical concepts and recent research on school closures. Next, we describe our study design and methodological approach before presenting our findings, which we then discuss using the perspective of transformative learning, along with implications for educational research and practice. We close with an overview of the main limitations of our study and an outlook.

Background

Conceiving of the pandemic as a “disorienting dilemma” seemed to capture students’ experiences of a disruption to their lives while allowing us to use the framework of transformative learning theory for interpreting our findings and thus connect our study to the present ESE discourse. In this section, we will therefore briefly introduce transformative learning theory focusing especially on its application within ESE, followed by an overview of the concepts of time use and meeting needs in the context of sustainability because these thematic areas were the focus of our research. A final section offers a summary of recent research on school closures during the pandemic.

Transformative learning theory

Within ESE, transformative learning is considered a powerful approach to enable learners to engage critically and reflectively with the global sustainability (Lotz-Sisitka et al., 2015; Sterling, 2011). The theory of transformative learning, which has its origins in adult education (Mezirow, 1978, 2009), has become an established learning theory in educational science (Howie & Bagnall, 2015, Taylor & Cranton, 2012). During the last two decades, transformative learning has experienced a growing research interest in ESD (Boström et al., 2018; Rodríguez Aboytes & Barth, 2020; Walshe & Sund, 2022) and become a core element of international ESE implementation strategies (UNESCO, 2021).

Transformative learning is understood as a process through which learners arrive at a permanent change in their frame of reference (Mezirow, 2009), often triggered by a “disorienting dilemma” (Mezirow, 1981, S. 7). This describes a condition in which learners are confronted with a situation in which their existing perspectives do no longer suffice to understand what they are experiencing, thus preventing them from devising strategies to solve it (ibid.). Although transformative learning processes also happen in everyday life (Sterling, 2010), there is evidence indicating conducive conditions. These include the opportunity for continuous self-reflection and discourse with other learners within a “safe and accepting learning environment” (Mälkki & Green, 2016, S. 169). Transformative learning needs to be distinguished from learning understood as mere knowledge acquisition because the latter is often discipline-specific without necessarily leading to permanent changes in a person’s worldview (Hoggan, 2020). Finally, transformative learning processes are cyclical and irregular (Alhadeff-Jones, 2012) and may thus happen over longer periods of time. While they can be stimulated, they cannot be induced in a controlled manner, and often only become visible in retrospect. Despite its originating in adult education, transformative learning is by now an established approach to adolescent learning, too (Illeris, 2014; Larson, 2016; Meerts-Brandsma &

Sibthorp, 2021). Recent research uses a transformative learning lens to inquire into the potential of arts education (Bentz & O'Brien, 2019), tackling issues of power and social justice with vulnerable youth (Kayumova & Tippins, 2021), or ESE-related topics such as sustainable food choices (Jones, 2020).

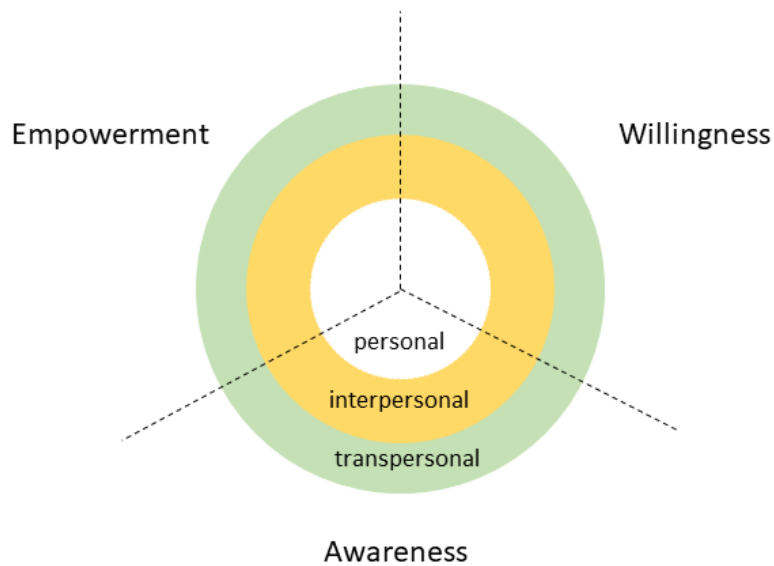
Meeting personal needs and spending one's time as learning challenges

Once schools closed, students had to reorganise their daily lives since losing familiar structures made it necessary to develop new routines and to make sure that they met their needs under the changed conditions. Two theoretical perspectives to address these challenges are the concepts of time use competence and human needs satisfaction.

Human needs satisfaction is a central concern in sustainability science as an idea that aims to ensure a good life for everyone today and in the future. Debates focus on how needs can be conceptualised (Gough, 2017), to what extent they are universal or context-bound (objective vs. subjective needs theories; see (Di Giulio et al., 2012) and to what extent people have an ethical right to have them satisfied (see e.g. the discussion about “protected needs” (see Di Giulio & Defila, 2019). A common and widely used distinction is that between needs and satisfiers (Max-Neef et al., 1989). People who strive to achieve a high degree of needs satisfaction through the way they use their time have a variety of options available to them. For example, the need for individuality can be satisfied by meditating and observing one's experience (Frank et al., 2022), or spending “self-time” at a hair salon (Holmes, 2018). Consumption thus represents one kind of satisfier (among others) and thus becomes merely a means to the end of satisfying needs. Time use can then be understood as a necessary practice of choosing satisfiers to meet one's needs (Shir-Wise, 2019; Southerton, 2020)

Time use from a sustainability perspective includes more than meeting one's own needs. Using time sustainably requires the consideration of further ethical conditions insofar as the effects of the satisfiers on ecological and socio-economic conditions of other people today and in the future to satisfy their justified needs have to be considered (Fuchs et al., 2021). Time use competence in the context of sustainability thus refers to:

“the ability and willingness of the individual to spend their lifetime in a self-determined and self-responsible manner and to participate in shaping the social organization of time in such a way that their own need satisfaction and the need satisfaction of others living today and in the future are not jeopardized” (Frank et al., 2022).

Figure 1: components and dimensions of time use competence (Frank et al. 2022)

The concept describes a qualitative approach to the subjective experience of time through its focus on individuals' needs and their satisfaction. This understanding of time use and its relation to sustainable consumption has influenced the present inquiry into students' time use and outcomes holding relevance towards ESE.

School closures, education and young people during COVID-19

Most of educational science research focusing on school closures deplors a decline in students' academic proficiencies (Engzell et al., 2021; Hammerstein et al., 2021; Kuhfeld et al., 2020). One reason, it is argued, is that, on average, students were spending less time per day on school activities than before the pandemic (Andrew et al., 2020; Hanushek & Wößmann, 2020; Wößmann, 2020). A second reason is that schools were unprepared for switching to remote learning (Forell et al., 2021) and, as a result, students and teachers often lacked necessary digital equipment and skills. Many students also did not experience conditions favourable to remote learning, including adequate emotional and academic support by caretakers, or a quiet space suitable for daily learning activities (Asanov et al., 2021; Dietrich et al., 2021).

Next to academic performance, students' well-being, too, seems to have declined during the pandemic, with students reporting increased levels of stress, anxiety and depression while feeling isolated during remote learning (Banati et al., 2020; Mastorci et al., 2021; Ravens-Sieberer et al., 2021). This was further exacerbated by young people feeling powerless because, in their view, policy makers neglected the needs of the young generation when making decisions concerning them (Andresen et al., 2020; Gabriel et al., 2020). Overall, evidence is unanimous in that those children and youth already marginalised and vulnerable before the pandemic experienced disproportionately negative effects on academic performance and well-being (Chénier et al., 2021; Dohmen, 2021; Lips, 2021; Schwartz et al., 2021).

There is some evidence showing that not all students have equally experienced learning losses (Depping et al., 2021; Gore et al., 2021), and that a minority, especially those living in comparatively favourable conditions, did not even experience major difficulties during the phase of remote learning (Bubb & Jones, 2020; Levrini et al., 2021). Little seems to be known, however, in how far students have gained skills and abilities, and which kinds of resources they may have mobilised during the pandemic (Hussong et al., 2021). In particular, ESE research has so far not yet inquired about the pedagogical potential of this highly disruptive event, despite claims that it might carry such a potential (Bai, 2020; Kollek, 2020; Wolff, 2020). Our research thus seeks to contribute to fill this gap by looking at students' learning experiences as potentials they have gained during this time.

Methods

Our research began two weeks after schools across Germany were closed on March 17th, 2020. Given that the COVID-19 pandemic was unprecedented and research on its transformative educational potential non-existent at the time, we decided to build our research on a grounded theory (GT) methodology (Corbin & Strauss, 2015). This allowed for an explorative inquiry into the phenomenon as it unfolded, as well as developing a theoretical understanding of what was happening in the process. The research was conducted by two research fellows who have several years of experience in the application of qualitative research methods in general, and GT in particular. Our research design comprised an iterative process of data collection and analysis.

Data collection

Data collection happened during two phases: the first from early April and October 2020 and the second between March and April 2021. Schools in Germany gradually reopened in May 2020. When, in December 2020, a second phase of school closures began, we conducted more interviews to compare secondary school students' experiences during the two phases. We were particularly interested in adding the perspective of students and teachers associated with so-called democratic schools where there is a greater emphasis on students' autonomy over their time compared to regular state schools.

Recruitment was initially based on professional contacts from previous research activities, and in the process became driven by theoretical considerations to further diversify the sampling (theoretical sampling). Data collection primarily comprised individual and group interviews conducted via Zoom. Audio tracks were recorded and transcribed verbatim by three student assistants. An interview guide was used to structure the interviews (see Appendix 1), although deviations were allowed if the conversation went in new directions. Interview participants were selected to cover different types of schools (see Table 1) and diverse socio-economic backgrounds. Despite our effort to achieve this goal, it was not possible to capture the entire spectrum of these conditions, hence the need to rely on second-person perspectives (e.g. on social workers providing information about vulnerable youth).

We interviewed 69 people (see Table 1). We obtained informed consent from all participants (or their guardians with under 18-year-olds) prior to the interviews. Interview data were complemented by online materials collected throughout the research process,

such as newspaper articles, student and teacher podcasts and blogs containing information related to young peoples' experiences and perspectives on school closures, time and/or sustainable consumption. These materials both served as theoretical inspiration and orientation and recruitment sources for further interviews.

Table 1: Interviewees per school type, grade, and geographical location

Category	No. of inter- viewees	Interviewees per school type		Grade ¹	Geographical range (federal states)
Students	45	grammar school	22	9	Hamburg, Northrhine-Westfalia
			13	11	Schleswig-Holstein; Lower Saxony, Baden-Württemberg
			4	12	Hamburg, Lower Saxony
		middle school	2	10	Baden-Württemberg
		vocational training school	2	12	Lower Saxony
		free/democratic school	1	8	Saxony
			1	9	Saxony
Teachers	14	grammar school	7		Hamburg, Lower Saxony, Northrhine-Westfalia, Schleswig-Holstein
		vocational training school	2		Northrhine-Westfalia
		comprehensive school ²	3		Hamburg, Northrhine-Westfalia
		free/democratic school	2		Baden-Württemberg
School principal	1	comprehensive school	1		Hamburg
Parents	4	grammar school	3		Northrhine-Westfalia
		free/democratic school	1		Baden-Württemberg
Social workers	3	free/democratic school	1		Saxony
		private pedagogical agencies	2		Hamburg, Lower-Saxony
other resource persons	2	Representatives of education networks			Hamburg
Total	69				

¹ Grades indicate an age range: grade 8: 13-14 years; grade 9: 14-15 years, and so on)

² Middle school includes school types *Realschule* and *Werkrealschule*

³ Comprehensive school includes school types *Stadtteilschule* and *Gesamtschule*

Data analysis

Data analysis began immediately after the completion of the first interview. Following Corbin and Strauss' (2015) recommendation, we began with line-by-line analyses and open coding of the first interview transcripts to familiarise ourselves with the data and develop the first ad hoc ideas of the phenomenon under investigation. Subsequent interviews were also made subject to (partial) line-by-line coding and open coding, accompanied by ongoing discussions about data interpretation within the research team. Data were analysed by individual researchers while engaging in an ongoing discussion process within the research team to enhance validity (Flick, 2014; Reichertz, 2013). We occasionally invited external experts from both academia (e.g. a university lecturer) and practice (e.g. teachers) to our interpretation meetings, too, allowing for a transdisciplinary multiperspectivity through "peer-debriefing" (Flick, 2007, S. 500) and "member check" (ibid., p. 501). Once we decided we were nearing theoretical saturation, we began a process of axial coding during which we sought to identify similarities, relationships and contextual factors between the single codes and refine these into a narrow set to core categories. In a final step, we discussed global interpretations of our findings. This step included a process of theoretical matching (Goldkuhl & Cronholm, 2010), leading to the use of transformative learning as a theoretical framework for interpreting students' learning experiences.

Results: Students' learning experiences related to spending time and consumption

Focusing on students' every-day lives during school closures enabled a variety of insights into students' learning experiences, which we are going to present in the following sub-section, followed by the presentation of relevant contextual factors, which we identified as relevant for explaining these learning experiences.

Learning experiences

From our general research focus on students' time use during school closures, we arrived at three main categories for learning experiences, which are presented in this section (see also Table 2).

Table 2: Overview of students' learning experiences

Learning experiences		Strategies
Acquiring increased awareness of time-related needs	Adapting daily routines	<ul style="list-style-type: none"> Adjusting sleep schedules Recreating school routine Organising daily routines according to individual preferences Realising the need for externally-provided time-structuring aids
	Learning time management skills	<ul style="list-style-type: none"> Developing individual work plans/schedules Adapting existing plans to own preferences Self-pacing learning routines Aligning school work and leisure in home environment
Creating alternative ways of needs satisfaction and time use	Adapting activities to the home environment	<ul style="list-style-type: none"> Carrying out leisure activities at home Taking up new activities or learning new skills Resuming activities formerly neglected Spending more time with families
	Adjusting consumption behaviour	<ul style="list-style-type: none"> Learning or improving cooking and/or baking skills Reducing consumption Switching to online shopping Using electronic media for socialising
	Appreciation of "small things"	<ul style="list-style-type: none"> Exploring environment around the home Going for walks Appreciating freedom of movement
Undergoing perspective transformation	Changing mental models and worldviews	<ul style="list-style-type: none"> Restructuring of daily routine by prioritising individual needs Re-evaluating individual ideas about the goal of education

Acquiring increased awareness of time-related needs

School closures removed many of the students' everyday routines, which resulted in an increase of autonomy over their time. This led to students' acquiring new insights into their time-related needs, which they showed through adapting their daily routines and by learning time management skills. Almost all students reported they appreciated being able to align their sleep and wake schedule with individual preferences: *"What I really like about Corona is being able to sleep in. During school, I normally get 6, 7 hours of sleep and now, if it's only 8 hours, I think, boy, I really didn't sleep well."* (SuSFG4_S2; grade 9)

Sleeping longer in the morning often went hand in hand with staying up late, yet most students reported they were trying to maintain a routine resembling their familiar school-day routine, for instance, by setting alarms. Not all students, though, enjoyed having more autonomy over their time. Those who struggled said that school closures made them realise they needed the structure provided by the school's timetable as a structural learning aid:

"So I am waiting for school to begin again. I notice that it is better for me if I have a certain structure, and a timetable and clear requirements for when to complete which assignment. (...) So there are those who say "hey, it's great when you can do what you want to (...) but if I am honest, I miss having this kind of structure, I need this structure." (SuSFG2_S1; grade 11)

Having to self-organise their remote learning schedules resulted in students acquiring or improving time management skills. Not only did they learn to plan their time, but they also reported being able to create routines fitting their individual needs: *"I am making my own plan [rather than using the one provided by the school] because if I didn't, I would finish everything last minute, and that wouldn't be very positive."* (SuSFG2_S5; grade 11)

Creating alternative ways of needs satisfaction

With contact restrictions in place and most shops closed, students needed to find alternatives to previously established ways of time use, which substantially included leisure and consumption-related activities.

First, students often adapted those activities they had previously pursued outside the home to the domestic context, e.g. replacing team sports like football or hockey with playing alone or with siblings in their gardens. Exercising, in general, was an important part of virtually all students' daily routine during school closures: *"When I used to go to football training [before the pandemic] I didn't go running that often. Now I go for a run almost every day."* (SuSFG5_S3, grade 9). Students also reported spending more time on other hobbies than before the pandemic, such as reading, gaming or playing music. Some said they had resumed activities they had neglected before, such as drawing, or begun to teach themselves new skills, such as juggling or playing the ukulele.

A second area relevant regarding young peoples' needs satisfaction was the adjustment of consumptive behaviour, including food consumption. Whereas during school days, students would either take a packed lunch, eat at the school cafeteria or buy snacks, many now appreciated preparing meals by themselves: *"I would say that I try to cook more myself now (...), which I like. Before, I often didn't have the time, and now I can take my time and I cook or bake more often."* (SuSFG5_S5; grade 9). During school

closures, students also reported they were buying fewer clothing items. This seemed to change once shops reopened.

A third area of consumption concerned the time spent using electronic media, which increased for almost every student. Because of contact restrictions, electronic media had become the main means for staying in touch with friends and family living. Students often self-critically mentioned the increase in their screen time, while emphasising the beneficial aspect of socialising: *“So I was gaming (laughs). A lot. But this enabled me to stay in touch with my friends. (...). If this is bad or not, I don’t know, but I needed something to do, right?”* (SuS4; grade 10)

A final aspect related to consumption relates to students’ expressing an increased appreciation of “small things”. This refers to aspects of their lives they had taken for granted before the pandemic, and which now seemed particularly of value to them. For example, going for walks near their homes as a source of joy and distraction: *“You learn to appreciate things more, like just going out, (...) I think I go for a walk every day now. You learn how to clear your head (...) and be happy about the small things (...).”* (SuSFG1_S1; grade 11).

Perspective transformation: Learning experiences leading to permanently changed mental models

Transformative learning experiences describe the change of mental models in response to a disorienting dilemma. In our research, we observed two kinds of transformative learning experiences: one related to time use, and the second to mental models of education. Regarding time use, two students spoke about preferring the autonomy to their time during school closures over their regular school routine because it allowed them to organise their daily routine fully in line with their individual needs:

“For me personally [school closure] is quite nice. I am an absolute late riser, so I will now get up at 11 am, do my homework during the afternoon or evening, can plan my time as I want to, and this is a lot better for me. I am also out and about a lot more. I enjoy fishing, and so you’ll go to some fishing pond, or play the guitar, do exercise; this works a lot better now without the fixed model of school.” (SuSFG2_S3, grade 11)

A second type of transformative learning experience appeared in relation to a students’ perception of schooling and academic performance:

“I would say that my understanding of achievement has changed, because of what some friends, who used to have some problems to follow in class, told me. They found having the chance of working at a slower pace better and also ask questions individually without everyone noticing it (...). So this changed my view of performance, which should not mean doing everything super good, but just in a way that everyone manages to understand everything.” (SuSFG6_S1; grade 11)

Most students, however, did not have seemed to achieve learning experiences resembling those presented in this section. In the next section, we are thus going to present contextual factors we identified.

Contextual factors relevant to students' learning experiences

We identified six contextual factors, which appeared relevant regarding students' learning experiences. These are: (i) students' individual dispositions, (ii) family and living conditions, (iii) access to digital learning infrastructure, (iv) teacher support and feedback, (v) school as a social space, and (vi) schools' focus on their professionalisation function.

Students' individual dispositions

Students who reported having little difficulty organising themselves even before the pandemic encountered the least difficulties in switching to distance learning. Young people with an individual disposition towards self-organisation thus seemed to have an advantage over others during a time when there was little external support.

In comparison, students who struggled with establishing a routine resembling their regular school day felt unable to draw clear, time-related boundaries between spending time on school-related tasks and leisure at home:

"I do no longer have fixed times for doing homework. Before, you would go to school, (...) and did other things during the afternoon and now it mixes throughout the day (...) so that during the entire day (...) it mixes and there are no longer any boundaries." (SuSFG2_S1, grade 11)

Living conditions and domestic situation

A second relevant factor was students' living conditions. All participants were living in single-family homes or flats with garden, either in villages, or parts of towns or cities where they could spend time outside in parks or other "green" spaces. All had their own rooms and none reported having to spend considerable amounts of time taking care of housework or younger siblings. Most also reported that conflicts within their families had not or only moderately increased while staying at home, and that they even enjoyed spending more time with their families than compared to pre-pandemic times. In contrast, teachers and social workers *reported a correlation between students' socio-economic background and their academic performance. For instance, students whose parents were unable to provide support during distance learning, for various reasons, were more likely to perform poorly or not complete any assignments at all.*

"[Some] completely lost their sense of time (...). They got up at noon, or 1pm, and I taught my biology class via Zoom (...), it was compulsory at first, but eventually I made attendance voluntary because I was tired of (...) watching the students in their beds. (...) I think the majority of those who didn't have parents who took care of them getting up earlier, those really lost their sense of time pretty much." (LuL12)

Access to and use of digital learning infrastructure

A third factor was the digital learning infrastructures. This involved access to digital devices as well as using digital communication and learning platforms for school assignments. Regarding devices, almost all students in our sample reported having access to either a tablet or a laptop or a desktop computer. However, the majority had difficulties communicating with teachers and schools electronically because when

schools closed, most had not yet rolled out any digital learning platforms. Where these were available, students reported about a lack of routine in using these:

„[It] was a total catastrophe during the first weeks because every teacher would just write something into any module and then you got another email saying ‘here are some assignments for you’ (...) and then you would not find them and they were hidden in some sub-folder. That really drove me crazy.” (SuSFG2_S3; grade 11)

After the first few weeks, students reported, teachers developed certain routines, resulting in better communication and organisation of assignments. Yet, the degree to which teachers provided support to students differed considerably.

Teacher support and feedback

During the time of remote learning, teacher support included their availability through digital communication channels. It also included the frequency and depth of feedback students received on their assignments. When students felt teachers did not respond timely, or did not return feedback, this negatively affected their motivation to further complete assignments. Experiences were mixed, with students reporting some teachers were committed to giving feedback while others were hardly reachable. However, students also described situations in which they found their teachers particularly helpful in handling a situation of crisis and insecurity, for instance, such as when teachers were communicating on a personal level rather than insisting on learning content:

“We meet twice a week [via Zoom] and we always make a quick round (...) and everyone chats a bit and this was super important that you notice you are not alone, and also that teachers changed from just giving us assignments to start looking at how we are feeling and react to this.” (SuS1; grade 12)

School as a social space

A fifth contextual factor is the role of school as an important social space. Once schools closed, it seemed that young people realised this for the first time. With contact restrictions in place, preventing them to meet their friends out of school, too, participants shared what school meant for them beyond learning: *“[I miss] being with 20 people in the same room, instead of looking at them on my screen, or just walking through the school and meeting people there.” (SuS1; grade 12)*. Next to socialising, students also realised the importance of their peer group for the learning process: *“I find it difficult now, because you have to do your assignments by yourself, and maybe at school, you would have split assignments with others, or you would help each other, and this is no longer possible.” (SuSFG5_S6; grade 9)*. Some students reported how they had self-organised messenger groups for discussing assignments and requesting help among their peers, but there were hardly any such spaces supporting group learning created by schools.

The dominance of the qualification function of education

A sixth factor was what we call the dominance of the qualification function of schools. Because schools mainly seemed concerned about students' academic performance, students feared possible negative consequences of missing out on curricular content. *“I don't like missing so much school because with remote learning we will never be able to catch up with what we missed, and maybe this will be a future disadvantage for us”*

(SuSFG4_S6; grade 9). Most students did not, however, seem to receive any feedback acknowledging their ability to cope with a stressful situation. This may have limited students' abilities to turning their focus on the skills and insights they were gaining during mastering the challenges of school closures.

Discussion: The transformative potential of students' learning experiences during school closures

Although the specific learning processes students went through depended on several contextual factors, our findings show how the disruption of students' daily routines has also ignited various learning experiences. Young people developed new approaches to shaping their time and found alternatives to satisfy their consumption-related needs during a challenging time. In some students, this resulted in perspective transformation. Yet, even where we did not find an indication this, we interpret the insights and increases in skills highly relevant regarding future educational practice and research, especially in ESE. In this section, we are thus going to discuss students' experiences as a potential for transformative ESE.

At the outset, we would like to point out that, in interpreting students' learning experiences in this way, we are aware that transformative learning is cyclical and occurs over longer periods of time. Therefore, the following represents a snapshot, rather than a definitive list of transformative learning outcomes observed during the research. The discussion is going to focus on the following three aspects: (1) broadening the perspective on learning beyond schools' qualification function, (2) creating safe, enabling learning spaces to support post-pandemic transformative learning for sustainability, and (3) conceiving of students' everyday experiences during the pandemic as resources for education for sustainable consumption. We conclude each sub-section with an implication for current ESE research and practice. The section ends with a brief overview of the main limitations affecting this study.

Broadening the perspective on learning beyond schools' qualification function

We found students' reactions to school closures characterised by a qualification mind-set, which we interpret as a major cause of limiting transformative learning processes. We use this term in accordance with Biesta's three domains of purposes of school (2009, 2020b): qualification, mainly referring to the transmission of knowledge and skills; socialisation, or "the (re)presentation of cultures, traditions, and practices" (Biesta, 2020b, S. 92); and subjectification, which refers to individuals' learning about "becoming a subject" (Biesta, 2009, S. 9). During school closures, schools seemed to focus mostly on their qualification function, resulting in students' fear of missing exam-relevant content. In doing so, schools were promoting a deficit-oriented view of the school closures by emphasising the dangers of learning loss (Engzell et al., 2021), rather than offer support to students through appreciating their overall handling of the disruptive situation.

However, "learning did not stop" (Biesta, 2020a, S. 1) during school closures. Therefore, instead of looking predominantly at deficits, Hussong et al. (2021) recommend looking at the individual strengths and resources young people mobilised during this challenging time. This connects to the goals of transformative ESE, which also aims to enable learners to use their own resources to tackle sustainability-related challenges (Sterling,

2011; Walshe & Sund, 2022). A recent study of a higher education course in ESE taught online during the pandemic, for instance, found that participants experienced it as rewarding because of two elements: students perceived the class a safe environment at all times and described a continuous interaction with peers and lecturers as key experiences in their learning processes (Hesen et al., 2022). Although this is but one case study, it points toward ESE's potential of balancing the functions of school during a time where students felt mostly unprepared to handle "existential challenges" (ibid., p. 100).

One implication of our study is therefore that insights from ESE research and practice might be helpful for formal education policy and practice to develop approaches to better prepare learners to address crises and the uncertainty these come along with (Gardiner & Rieckmann, 2015). ESE's well-researched theoretical and practical impulses for pedagogical approaches aiming at empowering young people (e.g. Tauritz, 2012, 2019) might thus be adapted by 'post-pandemic' educational settings.

Create safe, enabling learning spaces to support post-pandemic transformative learning for sustainability

While physical learning spaces were closed, schools mostly seemed to have failed to provide students with a safe learning environment during remote learning. Yet, from the perspective of transformative learning theory, creating "safe and accepting learning environments" (Mälkki & Green, 2016, S. 170) is important. Indeed, there is ample evidence that careful facilitation can foster these experiences. This includes, for example, providing sensitive pedagogical guidance (Cranton, 2002), allowing individual learners to pace their learning to accord to individual preferences (Alhadeff-Jones, 2019), and ensuring the continued presence of and interaction with other learners (Buechner et al., 2020).

Building on students' experiences during the COVID-19 crisis, creating safe learning spaces means ensuring learners are free from fear and also physical threats (Gabriel et al., 2020), and that their needs taken into consideration during decision-making processes affecting them (Andresen et al., 2020; Branquinho et al., 2020). It also entails focusing on enabling learners to handle negative emotions, which is where we can again relate students' experiences during the crisis and research from ESE. While students largely felt emotionally abandoned by their schools during the school closures, recent ESE research emphasises the importance of safe learning environments regarding learners' processing their negative emotions (Mälkki, 2019; Tillmanns, 2020). Singer-Brodowski et al. (2022) suggest the concept of "safe enough" learning spaces (ibid., p. 3) as an essential element in the preparing learners for present and future crises. In particular, the authors argue it is essential for learners to feel that teachers take their emotions seriously.

A second implication of our study is thus that, since learners mostly felt insufficiently prepared to address the uncertainty brought by the COVID-19 crisis, formal education might consider relevant findings from transformative ESE to develop approaches to creating "safe enough" learning spaces. This refers to teaching and learning approaches but also affects the physical aspects of classrooms and school buildings and it also includes developing approaches to creating such spaces in remote learning settings.

Conceive of students' every-day experiences during the pandemic as potential for education for sustainable consumption

Here, we wish to reiterate our point in that students' everyday experiences during the pandemic may be valuable resources for future ESE, especially regarding the topics of time use and sustainable consumption. The pandemic has created a unique situation where virtually an entire generation of students has experienced their schooling as being disrupted. We began our research with an interest in learning about whether there were any kinds of temporary changes in behaviour which might lead to more sustainable consumption habits. Yet, in our data, we found hardly any evidence for students intending to make any such permanent changes. Recent research inquiring into changes in consumptive practices during the pandemic has found similar evidence (Lins et al., 2022) and even signs for a general decrease in consumers' sustainability consciousness (Hüttel & Balderjahn, 2022).

Based on our results, we thus argue that ESE might use students' real-life experience during the pandemic to reflect on the kinds of temporary consumption changes they made during the pandemic and discuss these against the backdrop of the global environmental crisis. This is supported by recent findings from ESE research (Beasy & Gonzalez, 2021) and sustainability research (Hoolohan et al., 2022). We share the authors' conclusion, whereas temporary changes in individuals' everyday behaviour caused by pandemic-related constraints might serve as potential starting points for future sustainability transformations.

Although these results cannot be directly transferred to the situation of German students, we consider the findings relevant regarding implications of our study. It might be valuable to embed students' everyday experiences related to time use and consumption into ESE practice, especially as transformative learning approaches aiming at reflecting experiences and relating them to more comprehensive issues. Thus, awareness might be raised for the connection between individual behaviour and the global environmental crisis (see e.g. Kollek, 2020). One potential framework is the pedagogical approach of promoting time use competence (Frank et al., 2022) which for once might build on students' time-related experiences during school closures, but more broadly seeks to engage learners in a reflection of their time-related needs in relation to sustainability.

Summing up, students' experiences during school closures provide various opportunities for ESE to work with both in concrete pedagogical settings and in school-development contexts. As we have discussed, we consider schools' qualification function a main barrier to students' transformative learning experiences, and therefore suggest considering factors that create learning environments which students perceive as "safe enough" – with some conditions being universal while also being context-specific as different student populations have different needs. In particular, we argue in favour of making use of the manifold everyday experiences students made during the pandemic which, as our results show, demonstrate their creativity, flexibility and versatility in times of crisis – all of which are considered essential competences to be fostered by contemporary ESE.

Limitations

Concluding this section, we would briefly like to elaborate on four limiting factors we consider relevant in this study.

First, our findings are mostly based on individuals' self-reports and thus have to be interpreted with caution because responses are interpretations rather than individuals' objective representation of their experiences (Silverman, 2017). What's more, regarding adolescents, it has been debated about how far young people's developmental capacities may also affect the research because of their assumed limited abilities of reflexion (Schelbe et al., 2015). We do, however, consider young people "as articulate commentators of their social world" (Meloni et al., 2015, S. 107) and also tried to address this concern by doing a second round of interviews during the second period of school closures in Germany.

Second, our interview sample lacks in size, scope and diversity. It comprises 45 students from mostly socioeconomically privileged youth, even though we attempted to recruit young people with vulnerable backgrounds. Although we interviewed teachers and social workers working with socioeconomically disadvantaged youth, we are aware that their third-person perspective is not an adequate substitute for students' direct voices. Because this is a challenge which other researchers also faced (Andresen et al., 2020; Asanov et al., 2021), future research might thus try to address the situation and needs of this particular group of youth.

Third, we cannot rule out that the interview setting may have influenced' participants' responses. This refers first to using of Zoom instead of an in-person setting, although recent evidence suggests that data quality is not negatively affected by the use of videoconference software (Archibald et al., 2019; Jenner & Myers, 2019). Moreover, using Zoom and similar software for qualitative research has become an established research practice during the pandemic (Howlett, 2022; Oliffe et al., 2021). Second, the presence of two adult researchers as interviewers, too, may have affected students' responses, as well as the situation of students who took part in focus groups being randomly assigned to these, both of which might have caused feelings of fear or intimidation while speaking about personal experiences in front of others. We tried to mitigate this through a repeated emphasis on protecting individuals' anonymity as well as through including single person interviews and focus groups, and through cross-validating our findings with those of other empirical studies.

Fourth, although our study had an open-ended, exploratory interest in young people's experiences of school closures, a deliberate focus was on identifying areas and conditions in which students experienced learning processes. This appreciative perspective is a limitation in that it focused our epistemological interest on reported learning processes (rather than, for example, on the absence of specific learning processes, as in the many COVID-19-related learning comparison studies). This is important to bear in mind when we highlight the transformative learning potential of disruptive crisis experiences, such as pandemic-related school closures.

Conclusion

Unlike much current educational research, which focuses on learning loss during the COVID-19 pandemic, our study shows that there is another perspective. By broadening the focus from academic performance to young people's everyday lives, our results offer insights into how students responded to the disruption of their usual routines by developing new, individual time-use practices and alternative strategies to meet their needs.

The COVID-19 crisis has shown the degree to which societies are ill prepared and vulnerable in light of disruptive events at a large scale. Another present crisis is climate change, which is a “wicked problem” (Engler et al., 2021) that ESE seeks to enable learners to deal with. Our study is therefore relevant to both ESE and general education research and practice, as we believe that multiple lines of connection can be drawn from students' experiences during the pandemic to ESE's concern with helping learners cope with sustainability-related crises. Future research could build on our study and aim to take a longer-term perspective on young peoples' 'post-pandemic' transformative learning processes. In addition, future research could also explore concrete learning approaches and formats enabling students to develop time-use strategies that better meet their individual needs in formal educational settings (Frank et al., 2022).

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Ethical Approval

The research was approved by the ethics committee of Leuphana University, Lüneburg, under the reference EB-Antrag_2019-07_Fischer_ReZeitKon.

Disclosure statement

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A6 Declaration of Authorship

In accordance with §16 of the guidelines for cumulative dissertations, my individual contribution to preparing the three research papers is presented in the following section. The individual scientific contribution of all co-authors, including myself, is indicated under *author contributions*. The relative importance of the doctoral candidate's own contribution in relation to the contributions of the other co-authors is indicated by a weighting factor (*declaration of authorship*) (see the end of this section for more information on the weighting factors).

Paper 2

Title	Time and sustainability: A missing link in formal education curricula
Authors	Grauer, C., Fischer, D., & Frank, P
Authors' contributions	CG and PF designed the study and collected and analysed the data. CG wrote the first draft of the manuscript supported by DF. PF and DF reviewed and edited the manuscript.
Declaration of authorship (weighting factor)	Predominant contribution (1.0)
Publication status	Published 2022 in <i>The Journal of Environmental Education</i> 53(1), 22-41
Presentations at conference	N/A

Paper 3

Title	(Re-)learning time use and perception for sustainable development in schools – Qualitative results from a self-inquiry-based learning intervention.
Authors	Frank, P., Grauer, C. & Fischer, D.
Authors' contributions	CG and PF designed the study and collected and analysed the data. PF wrote the first draft of the manuscript, with CG and DF drafting individual sections. PF, CG and DF reviewed and edited the manuscript.
Declaration of authorship (weighting factor)	Equal contribution (1.0)
Publication status	Manuscript under review in <i>Environmental Education Research</i>
Presentations at conference	European Conference on Educational Research (ECER), 9. September 2021 (virtual) Grauer, C. (2021): „It's Time to Talk About Time Shaping Competence: A Framework for Addressing "Time" in ESE". https://eera-ecer.de/previous-ecers/ecer-2021-geneva/

Paper 4

Title	<i>Learning to spend time in unusual times — An inquiry into the potential for sustainability learning during COVID-19.</i>
Authors	Grauer, C.; Fischer, D. & Frank, P.
Authors' contributions	CG and PF designed the study and collected and analysed the data. CG wrote the first draft of the manuscript with PF drafting the method section. PF and DF reviewed and edited several drafts of the manuscript.
Declaration of authorship (weighting factor)	Predominant contribution (1.0)
Publication status	Manuscript submitted for publication to <i>International Review of Education</i>
Presentations at conference	Global Perspectives on COVID-19 and Sustainability Transitions; 27. Mai 2020 (virtual) Frank, P., Grauer, C., & Fischer, D. (2020) „School closures and the COVID-19 pandemic: Is there a transformational potential for Education for Sustainable Development/Education for Sustainable Consumption?“ https://hd-ca.org/15860
	European Conference on Educational Research (ECER), 9. September, 2021 (virtual) Grauer, C. (2021). „Now I Appreciate the Small Things in Life.“ – An Inquiry into Learning Potentials for ESE by Researching Students' Time Use During “Lockdown”“. https://eera-ecer.de/previous-ecers/ecer-2021-geneva/

Paper 1 (grey literature)

Title	Zeitgestaltungskompetenz
Authors	Frank, P., Fischer, D., & Grauer, C.
Authors' contributions	PF drafted the working paper. CG and DF reviewed and edited the manuscript.
Declaration of authorship (weighting factor)	<i>Important contribution</i> (0.5)
Publication status	Arbeitspapier im Projekt ReZeitKon. Leuphana Universität, Fakultät Nachhaltigkeit. http://www.rezeitkon.de/wordpress/wp-content/uploads/2020/11/ReZeitKon_Zeitkompetenz_final.pdf
Presentations at conference	N/A

I certify that all the statements made in this Appendix, individually and in the aggregate, are true and correct.

Lüneburg, 27 October 2022

Claire Frances

According to §12b of the guideline for cumulative dissertations, PhD student's contributions can be as follows (number in brackets is the respective weighting factor):

- *Single authorship*, if the PhD student's own contribution is 100% (1.0)
- *Predominant contribution*, if the PhD student's own contribution is greater than the individual share of all other co-authors and is at least 35% (1.0)
- *Equal contribution*, if (1) the PhD student's own contribution is as high as the share of other co-authors, (2) no other co-author has a contribution higher than the PhD student's own contribution, and (3) the PhD student's own contribution is at least 25% (1.0)
- *Important contribution*, if the PhD student's own contribution is at least 25%, but is insufficient to qualify as single authorship, predominant or equal contribution (0.5)
- *Small contribution*, if the PhD student's own contribution is less than 20% (0)

A7 Declarations and Statement

I hereby declare that I have neither undertaken nor applied to undertake any other doctoral assessment.

I hereby declare that the thesis entitled *Learning time in ESE. Promoting time as a resource for sustainability in formal education* has not been submitted to any other academic, that I have submitted the thesis only as part of this and of no other doctoral assessment, and that I have not previously failed any other doctoral assessments.

I hereby declare that the thesis submitted *Learning time in ESE. Promoting time as a resource for sustainability in formal education* is all my own work and has been produced without any unauthorised assistance. I have not used any aids or material other than that specified. I have referenced all sources used.

Lüneburg, 27 October 2022

A handwritten signature in blue ink that reads "Claire Frances".