Discover Sustainability

Research

Sustainability agency in unsustainable structures: rhetoric of a capable transformative individual

Janne J. Salovaara[1,2] · **Sophia E. Hagolani-Albov**[2,3]

Received: 18 February 2024 / Accepted: 25 June 2024
Published online: 02 July 2024

Abstract
While sustainability as a practice has been implemented in education for a long time, the conceptualisation of an impactful sustainability actor has not been as thoroughly formulated. The theory of structuration is relevant as a lens for critical reflection on the transformative potential of individuals educated in sustainability as a practice, who are often described as change-makers and mandated to enact sustainability. This paper examines sustainability agency using materials produced for a set of online sustainability courses. This text corpus is utilised as a representation of climate and sustainability education. The materials repeat systemic framings present in sustainability rhetoric, such as the contexts and targets in which sustainability transformation occurs. Additionally, through a qualitative content analysis of the textual corpus descriptions emerged as attributes of the agents to enact sustainability. This uncovers the juxtaposition between the often-repeated perception that sustainability must be achieved by capable agents and the capacities they possess. Further, our content analysis suggests a rhetorical process of *otherin*g within sustainability, for example by positioning "*people*"—the general population—as the cause of the sustainability crisis, and "*us*"—the educated—as the solution. Through our findings, the article concludes that when utilising the concept of sustainability agency—be it in theoretical, educational, or practical work—one ought to pay significant attention to the structures wherein the activities take place. The full comprehension of the transformative potential of individual agents ought to include an acknowledgement of the difference between educated capability and capacity—the latter of which necessitates dominance over the structural resources.

Keywords Sustainability agency · Structuration · Education · Professionalism · And impact

1 Introduction

Sustainability is a theme that is present in almost all aspects of development [1] and contemporary societal rhetoric [2], for example, sustainability as a theme is often found in political, media, and education discourses. Sustainability is also promoted through many different instruments, for example, intergovernmental treaties [3], regional policies [4], corporate mission statements [5], and consumer centred educational materials [6]. In the arena of higher education, one can find the concept of sustainability present in the intended learning outcomes of curricula across many disciplines and levels of study [7]. In addition, sustainability as a concept and goal is often articulated in universities' social responsibility plans [8], and other documents that guide the educational and administrative strategy of the University. Beyond the University

✉ Janne J. Salovaara, janne.salovaara@helsinki.fi | [1]Institute for Atmospheric and Earth System Research (INAR), University of Helsinki, P.O. Box 4, 00014 Helsinki, Finland. [2]Helsinki Institute of Sustainability Science (HELSUS), University of Helsinki, Helsinki, Finland. [3]Global Development Studies, Faculty of Social Sciences, University of Helsinki, Helsinki, Finland.

setting, sustainability is applied in many different practical contexts [9], where practitioners are meant to enact sustainability through their work practices [10] or the practical implementation of their scientific thoughts [11]. A prominent narrative is the possibility of transformation through the practice of sustainability [12] and the expectation that the application of sustainability thinking will bring profound changes to business-as-usual [13]. Within such transition narratives [14], education continues to be an area of focus [15], partly because many modern human actions—often deemed unsustainable—are an outcome of modern schooling [16]. In this paper, we analyse curricula from a set of courses, to highlight the intended transformative outcomes through the actions of educated sustainability [17].

Inserting sustainability thinking in education has taken various forms and has been a frequent research topic, which is approached from many different angles. For example, Thorén and Breian [18] investigated the reciprocal relation between knowledge-making institutions and the societal sustainability issues at large. While Lozano et al. [19] developed a systematic scheme, which reflects the positioning of sustainability discourse and practice within the scientific and managerial layers of universities. In addition, sustainability has been used as a frame to conceptualise the education of post-disciplinary [20] certified "change-makers" who are then charged with enacting transformative measures in their post-university working lives [21], regardless of typical barriers to employing sustainability [22]. Thus, after more than a decade of developing sustainability education [23], and the various formulations of specific competencies for sustainability [24], it seems appropriate to examine whether an approach that looks at the actions and motivations of individuals [25] against a relatively stable system [26] can be more fully explored and effectively utilised [27]. Achieving sustainability is a complicated endeavour even when conceptualised through such typical composition as the three pillars of sustainability. This is perhaps due to competing tensions between the pillars, which at times serves to foster contradictions within the principles of sustainability [28]. This difficulty is further underpinned by the critical lens used to view societies [29], especially the tendency to cheapen nature in support of accumulation at all costs [30]. Beyond being a motivating factor for human activities and the (scientific) worldviews that accompany these activities, there is a debate over the base question of sustainability itself—what should be sustained and what transformed [31]?

Though academia has spent many years examining sustainability study, practice, and research, a fundamental question still revolves around the effects practitioners have (e.g. [32]), and if they are in practice effective to enact the sustainability transformation. There has been a concerted effort to develop sustainability expertise through different framings of individual qualities. Wiek et al. [33] highlighted the need for educated key competencies for enacting sustainability, which has evolved into a lively academic discussion that is still going on (for example see [32–36]). Martin et al. [37] elaborated on integrating sustainability to one's professional practices using a systems approach, where others have framed the enactment of sustainability using a variety of practice-approaches (see for example [38–41]). Thomas et al. [42] explore professional advocacy as a path to concretising sustainability, with several others suggesting different framings and theorisations related to actors and actions (e.g. [43–45])—with another as an *enabling* approach, combining structure and practise approaches [46]. While these approaches highlight different key components, they generally share similar attributes such as identity, values, knowledge, competencies, and experience.

A robust depiction of a reliably effective, impactful sustainability actor has not yet been fully explored [47]. Simultaneously, some of the negative effects that can be caused by the lack of professional contextualisation in sustainability education have been recognised [48]. Yet, there has been a shortfall of broader attention and elaboration related to articulating or defining the context which best fosters the expert qualities needed to further sustainability transformation [49]. Following these observations and the recognised research and knowledge gaps present in the concept of sustainability agency, we take on the definition forwarded by Teerikangas et al. [50], which positions sustainability agency as the *capacity* of different actors to act toward sustainable futures. Building off this definition, we argue that agency capacity differs from capability by contextualising Structuration Theory through sustainability education, which is a source for the change-agents and individual actors [51] to emerge and further the process of transformation. Thus, the purpose of this research is to contribute to climate change and sustainability-related education and initiate a discussion around sustainability agency that spans from its capabilities to the critical structures and capacities—predominantly in the contexts of education and the resulting professional practice of sustainability. Ultimately, this theoretical elaboration aims to contribute to the overall sustainability impact of institutional, organisational, and professional sustainability practices.

2 Theoretical thought

Professionals of sustainability may occupy a difficult position once they leave the confines of higher education [52]. While they might have received an education in sustainability, their education does not always suggest an explicit context in which to enact sustainability in practice. The gap between knowledge and action [27] and more specifically the gap between knowledge and professional practice is especially visible in fields where sustainability is applied rather than generated. While sustainability is often highlighted as a practice that is flexible to field-specific contextualisation [53], the explicit mechanisms of the practice of sustainability still lack practical and applicable generalisation [54]. Without getting into a deliberate criticism of the theorisations and conceptualisations of the actors and contexts that serve to operationalise sustainability (e.g. [47]), this article suggests the utilisation of Structuration Theory to better understand the operationalisation of sustainability. This theory could offer a novel perspective to this operationalisation of sustainability through a more critical take on the often normative sustainability transformation [55]. One must revisit Gidden's Structuration Theory when observing the general transformative potential of sustainability actors (e.g. [49]) in different schematised contexts (e.g. [56]). Theories related to transformation—although differing in essence [57]—such as Actor Network Theory [58], Multi-level Perspective Theory [59], and Social Practice Theory [60] have been widely utilised in sustainability research and planning (see for example [61–63]). Such theories have parallel interests with Structuration Theory—with respective epistemic differences (e.g. [64]), for example, the view the theory in question takes on perspective and its relation to reality [65]. However, the scope of this article is not to examine the practicability of a potential theory as a critical inquiry to the aforementioned problem(s), with a pragmatic approach to societal reality; but instead accepting "all forms of humanism are considered to be "ideological" since they distortedly take our wholly superficial subjectivity seriously" ([66], p. 28) while relying on multiple expressions thereof [67].

2.1 Gidden's structuration

Structuration Theory was introduced in the late 1970s [68] and elaborated in the early 1990s [69]. This theory uses the metaphor of a stage play to describe the various elements within the theory; thus, we will refer back to this framing throughout the analysis and discussion. Giddens' theory called for human agency in a critique of other existing theories, for example, Parsons' sociological theories. Giddens ([68], p. 235) famously stated, "the stage is set, the scripts written, the roles established, but the performers are curiously absent from the scene". However, in this study, the more relevant question is whether the performers are on the right stage and whether the script is thoroughly understood. Thus, the focus is justifiably on navigating through the dimensions of the theory that seem practical to the emerging critical sustainability, rather than aiming for a systemic sociological dive into sustainability. Structuration Theory is principally concerned with "connecting a notion of human action with structural explanation in social analysis" ([68], p. 49). According to Giddens, such a connection demands, "a theory of the human agent […]; an account of the conditions and consequences of action; and an interpretation of "structure" as somehow embroiled in both those conditions and consequences" (ibid.). Structuration Theory serves to link various aspects of sustainability, including the processes by which sustainability is furthered [56], and the practices of these processes [70]. This can also be extended to the different actors involved in the processes of sustainability [47]. These processes and actors can be thought of as features in an aims-oriented professional field [71]. This is especially relevant when sustainability is represented as a multifaceted endeavour that is undertaken via educated acts [72], which are then geared towards sustainability transformation [73]. Structuration refers to a broad and systemic operation of a human process and intent, without identifying the self-present in self-organisation [74]. Alternatively, it can be perceived as a specific scope of structures, or domains of operations, for example in Actor Network Theory or Multi-Level Perspective Theory. Thus, Structuration Theory is applicable to analyse processes on the macro-to-micro level and processes present on the rhetorical societal stage. Thus, it is relevant to observe the emergence of social processes, specifically coexisting activities within a structure; where one activity is not able to be brought into being without the other [75]. Yet, while the activities themselves are mutually interdependent, in practice they still can be examined separately as their specific features differ.

The "structure" in Structuration Theory has several descriptions; for example, as a "medium and outcome of the practice which constitute social systems" ([76], p. 27), or as "'rule-resource sets' which are included in the institutional

framework of social systems and have a virtual existence" ([77], p. 13). Further, the structure is also described as being "composed simultaneously of schemas, which are virtual, and of resources, which are actual" ([78], p. 13). Resources are highly important in the agency-structure schematic. According to Shilling [79], structures are sets of rules and resources that social interaction can be "drawn on". In the context of sustainability transformation, the importance is in the *dominance* tied to power and control over the resources (ibid.). It follows that the resources are considered as the *stuff* through which actors have (or do not have) the capacity to make "things happen" ([76], p. 170). Through actors' actions, which reproduce societal structures, the issue of transformation prevails. That is, actors reify structures, although the act is never automatic as it is simply being guided by the structure alone, but they are rather seen to be *at risk* to get reshaped instead [78]. Thus, it is interesting to note where the act either reifies or changes the structure, for example, for procedural reasons such as an actors' intersectionality (ibid.), or where actors operate in consideration of other actors. Other actors, who "reproduced relationships between individuals and collectives" ([76], p. 169) appear as another dualism in the agency-structure concept. This means that on one hand, they serve to exemplify an actor and acts, while on the other hand, they also materialise as structure. Although agency generally refers to a flow of acts that constitute the reproduction of the structure [80], according to Giddens the structures are enacted by so-called knowledgeable human agents, who "know what they are doing and how to do it" ([78], p. 4). This means these actors have transformative potential to alter the action's structure. Structures are not meant to be constraints to action, but instead, they enable agents to employ their capacities (knowledge and resources) in "creative or innovative ways" (ibid.).

Action and actors, which at times are used interchangeably with agency and agents [68], refer not only to individual acts but to the seamless conduct of processes in the real-world. Thus, this theory allows one to conceptualise general human actions and—potentially—actions that are undertaken by a coalition of actors [81]. Human action and interaction are seamlessly structured, that is replicated and unremitted [75]. Beyond agency-structure as a postulation of human process, another key with this theory is the recognition of agency in "just about everyone"—that is, every actor has the potential for impact, not due to the working of a higher consciousness—but "by virtue of their participation in multiple social systems" ([70], p. 147). This class of transformative potential refers to the capability to choose to participate in one practice-system over another (ibid.) rather than wholly transforming one practice. The capability to exercise control over a practice, or the impact of exercising control over participation (ibid.) defines the actor's transformative potential by simply, "being able to do otherwise" ([66], p. 9). Agents are presumed to "know a great deal (if not all)" about society and its constructs and thus are able to utilise the structures, while being able to also articulate the structure's being ([79], p. 82). This dualism attributes a higher consciousness to such agency knowledgeability, which renders this different from, for example, experimentation [82]. This attribute of knowledgeable agency creates the bridge to education and subsequently the extension to educated professionals. Indeed, professionalism "provides a window to agency as expertise" ([83], p. 276), and in some cases, further explains the asymmetric knowledge and resources between actors and some agents who are otherwise equal in their potential.

The schema of actors (by the virtue of being) becoming knowledgeable agents (of change) through (sustainability) education and allocated (professional) resources, is connected to the idea of structuration dominance in acting for sustainability change. This happens in the sense that the agent has the capacity to dominate, but this can also be triggered by a decision to suspend change. Even with knowledgeable (educated professional) agents (with resources), the capacity to transform relies on the dominance over the structure in action (Fig. 1), rather than on the knowledgeability of the agent or necessarily even the allocated resources—with the exemption of acknowledging the dual construct of resources being a form of dominance. When employing transformative action through domination over resources, there are a few emergent notions of nature and the direction of the aforementioned elements. Domination, especially in the context of sustainability and sustainable transformation, is represented by the current structures and the power laden by their societal presence. These commonly manifest as norms, rules, or institutions; however, this can even be seen in

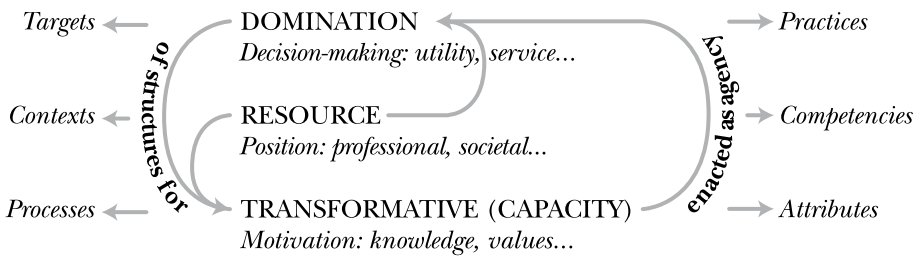

Fig. 1 (Adapted from Giddens 1979). A representation of the agency-structure schema between the dimensions of domination, resources, and transformation

the individual's *expectations for the future* [84]. Thus, resources appear as neutral and indifferent, utilisable for change or reification, and as an extension of domination and transformation, while the transformative capacity emerges from autonomy to enact the alternative. In other words, to be free of domination in autonomy to transgress the current.

3 Materials and methods

Following this theoretical framing, our aim is to synthesise a purely qualitative analytical apparatus with which the articulations of structure, acts, and agency can be explored through the analysed materials. Climate change and sustainability education often takes an approach wherein the ideals are well represented, but sometimes compromised in favour of maintaining a practicable point of view. This intended praxis is the reason for the selection of the materials used in this analysis. However, this analysis is not intended as an assessment of these specific educational materials for their approach to sustainability; rather, the materials are taken as a selection of commonplace sustainability-themed education. The materials analysed herein serve as a micro-study of the representation of sustainability practice through its education, issues, approaches, professionalism, and rhetoric at large. To continue, our aim was to select material suitable for exploring various instances of agency that was simultaneously manageable, but with reasonable depth and breadth to perform a content analysis. With these materials as a generalisable example, we refer to both the commonplaceness of the selected materials—not as a comprehensive review of sustainability education, but as an example, which we assert echoes the contemporary sustainability rhetoric. This analysis is also generalisable in that there is no strict disciplinary scope specifically applicable to one academic discussion, rather the findings apply to several disciplines related to sustainability since this argument is about the form and function of sustainability education at large rather than the specific content.

3.1 Climate University study materials

Climate University [85] is a climate change and sustainability-themed online education network based in Finland and jointly administered by 27 different Finnish higher education institutions. The Climate University platform hosts nine individual English language courses (Table 1), each worth a total of 5 European study credits (ECTS), which is equivalent to 140 study load hours. The courses are mainly created and taught by the staff of the university that is in charge of coordinating the specific course in collaboration with other universities and research institutions. The courses were co-created by numerous scientists, educators, and practitioners of various scientific disciplines that represent a broad view and considerable expertise on the topics at hand. A majority of the courses were created within the last five years, which makes their contents relatively current. Most of the courses are intended for master's level students or students participating in continuous learning, coming from any disciplinary context and any higher education institution. It should be noted that these courses are actively marketed mainly to students within the Finnish higher education system, but in practice the courses are also open to students coming from outside the Finnish system. While some of the courses have been made mandatory in the master's programmes of various partnering universities, the courses are predominantly taken individually as elective courses. Often the courses follow a structure that flows from thematic reading materials to weekly and final individual and/or group assignments (utilising the flipped classroom model, see for example [86]).

Table 1 Study materials used in content analysis

Course	Main content	Identifier
Biodiversity.now	Biodiversity, which highlights human and individual participation in its issues	Biod
Circular.now	Circular economy and its practical applications	Circ
Climate.now	Climate system and changes therein	Clim
ClimateComms.now	Communication of environmental and sustainability issues	Comm
Leadership for Sustainable Change	Issues, principles, applications, and competencies for sustainability	Lead
Solutions.now	Real-world organisations applying sustainability solutions	Solu
Statistical Tools for Climate and Atmospheric Science	Collection and utilisation of climate-related data	Stat
SystemsChange.now	Natural and human systems and their interactions	Syst
Sustainable.now	Concepts and themes of the dimensions of sustainable development	Sust

The assignments are typically structured to spur reflection on what was learned in the course and to observe instances of the theoretical material as it plays out in real-world case contexts. Thus, the learning experience relies on materials that address several aspects and approaches to the current sustainability issues and suggested solutions. The materials also suggest multiple ways for the learners to continue to engage with sustainability beyond the confines of the course.

The course materials utilised in this content study were the following:

1) The course syllabi, which included intended learning outcomes
2) The course introductions with specific approach(es) to the themes of the course
3) The instructions for course assignment, which provided explicit verbiage on the suggested problems, actions, and approaches to the issues highlighted in each course

3.2 Content analysis

With the presented theoretical background in mind, we formulated a content analysis framing (Fig. 1) for the materials described. Our point with the analysis was not to pinpoint specific keywords that could then be utilised in a quantitative study, but rather to develop a thematic map, which allowed us to reflect on the reappearing agency-structure elements present in the material. The analysis was based on the course materials (accessed via the course platform website in December 2022) and the coding was conducted by the corresponding author using Atlas.Ti. The structure was conveyed as different targets and contexts of activities and operations, notions of resources (through which structures are enacted), and as general attention and interests expressed in the materials. In this analysis, agency was interpreted as something projected through the abilities, capabilities, and knowledge-based activities, acts, and engagements with the structure. However, as this analytical framing is dualistic in nature, a strict distinction between the structures, materials, and agency, seemed unfruitful. Thus instead, the analysis aims for a meta-level understanding, which in some research is called a phronetic approach [87]. The content analysis [88] utilised herein, takes representations from the theoretical framing, which means simply that the findings rely on the relations to agency and structure that emerge from interpreting the material, from which quotes are utilised to exemplify these representations. This type of examination seeks to reveal instances [89] of the structure and agency present in the sustainability stage, script, and actors to address the suggested professionals' practices [10]. The individual instances cumulated into numerous themes under the different structuration classes that are detailed below.

4 Findings—sustainability structuration

The findings proceed as an interplay between findings and our interpretation of them while using direct quotes from the materials that exemplify the points at hand. We have indicated after each quote which area of the corpus the quote originated (Table 1 for the course abbreviations). In our aim to create an organic flow between the examples and the wider analysis of the text, certain themes emerging from the content analysis are further elaborated due to their relevance to the sustainability transformation discussion.

4.1 Purpose—understanding the direction of sustainability

The ecological-environmental dimension of sustainability prevails throughout the rhetoric and is often further emphasised by reflecting the other dimensions of sustainability (economic, social, and cultural) through their relations to ecological sustainability. This is evident, for example, through questions like: What are the connections and the conceptual differences between social and environmental sustainability? By framing the question in this way, the environment serves as a backdrop against which cultural sustainability is akin to a resource through which environmental sustainability is furthered. It should be noted that culture was also referenced as something to be sustained; for example, as evidenced in a question from one of the courses, "What cultural practices do you think should be changed and which are important to retain?" (Sust). Whereas other concepts under the umbrella of sustainability, like Circular Economy, are addressed as an environmentally sound economic model achievable through a reformation. Within such framings, the Sustainable Development Goals (SDGs) are often synonymous with sustainability in operation, or sustainability as defined by its issues—at the same time the SDGs seem to get utilised with very little critique. Similar attempts to strategise sustainability come in the form of different indexes, such as those meant to measure a collection of chosen quantitative processes, like the

Sustainable Development Index, which quantifies "the ecological efficiency of human development" (Sust). Although, such a comparison expresses the pervasiveness of the now normative belief that human development is a process that can happen in an ecologically efficient way. As the name of the course collection suggests—Climate University—the courses are, at least as a whole, environmentally oriented and thus the authors and the materials they produce have an observable disciplinary inclination to the natural sciences. However, the ethos of such tools, reflected by their approach to systemic sustainability rather than to unidimensional sustainability (e.g., economic), exemplify an ontological standpoint of "humans" being separate from "other animal species", that is humans are considered as being separate from the wider "ecology". The examined materials are in line with the normative assumption that "sustainability" is universally good and the right path to follow. Situationally, this normativity is reflected in statements like the following, "Think further about the worldviews that are connected to your chosen sustainability issue […] Is there a subjective or objective truth to be discovered about the issue?" (Lead), and such critical prompts as, "Reflect on what reliable information is. Where can you find reliable information about climate change?" (Lead) and "examine whether different sources give different estimates" (Lead), and such notions as Climate Fiction—as a form of communication, and bringing up the concept of eco-dystopia, suggests that sustainability's normativity could potentially slip into eco-hegemony.

In addition to the aforementioned theoretical reflections, sustainability is predominantly contextualised through its concrete contribution to real-world situations, in addition to the overarching transformative aims. From the conceptual perspective sustainability is often contextualised as a representation of a more systemic view on human-nature relations. This systems thinking is often grounded in in-situ contexts that range from the global to the local and are utilised as a situated example of representations like, "Climate Change as a global challenge" (Syst). At times the so-called real-world appears as a rule of ethics, at times as a request for concrete steps to be taken, and at times as an assessment of the global relevance of a project. Sustainability is also sometimes defined through its problems, for example, "Understanding the context. Explore the social, legal, political, environmental, economic, practical drivers, barriers and risks of the case" (Lead). In this example, sustainability serves as a justification for why change is needed. That is, in this case, one would be successful by *achieving* sustainability. Yet, another form of contextualisation applied to sustainability comes through socio-spatially, for example through observing one's own surroundings. "Take a photo of your environment close to you" (Biod). The socio-spatial context is also expressed by calling attention to widely known environments, such as the Arctic, or *culturally significant* locations in the world. It should be noted that this often comes in the form of references to problematic locations, like where sea-level rise is predicted to have a catastrophic impact.

This contextualisation brings up questions of differing ontologies. Sustainability—whether through its principle or problems—is acknowledged to be a construct of multiple perspectives. Simultaneously there are several different tensions/domains, actors/sectors, and competing values/knowledge(s) at play. The scope of these perspectives ranges from the presence of intergovernmental alignments, such as the Paris Agreement or Conference of the Parties (COP), to considering personal biases in scientific disciplines or even by asking questions like, "What will happen to the squirrel?" (Clim). However, it should be highlighted that in methodology-focused courses it is apparent that such epistemic perspectives are absent, or the previously addressed normativity, rather it is replaced by a clinically neutral and technical approach. In science—whether basic or applied, interdisciplinary, or transdisciplinary—sustainability is further defined, and science-making also becomes a target for sustainability change. While science is used to generate change, a reconceptualisation of the processes of science itself ought to be explored. For example, are there contemporary ways of science that can produce sustainability? In general, sustainability rhetoric delivers many different expressions of difficulties, while in some instances sustainability itself is even acknowledged and accepted as a near-impossibility. It is precisely the complexity of these multi-dimensional sustainability issues and the complication of resolving these issues that sets up the imperative for the task of enacting sustainability. Such tautology can truly represent some situations, or be a pre-emptive management of expectations, or be simply an outcome of the existing paradigm wherein actionable sustainability seems unimaginable. This is evident in expressions such as, "Sustainable development is a concept that is multidimensional and difficult to define" (Sust) and "climate change can no longer be completely stopped" (Sust). This same idea is also reflected in the historical absence of achievements, "Does the first [IPCC] report [from 1994] already communicate the need to reduce emissions and the sense of urgency?" (Comm). All of these conceptualisations share the common undertone of transformation being represented as a struggle.

4.2 Structure—where and how is sustainability practised

In typologising and searching for taxonomic instances of the *structure* in the materials used in the Climate University, an emphasis on targets of action emerged. Targets such as fields, organisations, sectors, roles, and contexts of operations

alike, represent a simplification of structures but serve as functional approximations in this paper. In addition to these targets, other types of structure emerged, for example, the processes and practices that agents engage with in pursuit of actionable sustainability. These appear in the materials in a few different ways, including (1) issues as predefined problems—like those related to ecosystem services; (2) concepts—like suggested services or products as solutions; (3) a restructuring of the problem—like the concept of *planetary boundaries*. Somewhere between a stage and a structure, are the sustainability schematics, such as thinking in *weak* or *strong* sustainability. Schemes like the SDGs appear as a structure of sorts, being proposed as a plan for sustainability—although, again with little critical thought on what kind of sustainability is fundamentally promoted. For example, do Circular Economy measures actually promote socio-economic equality, which is a pillar of economic sustainability?

Similarly, concepts like Climate Scenarios and other forecasting devices function as targets and structures. Under this understanding, processes are structures within which agency can take shape, i.e., "what is the natural scientific frame of the question?" (Syst). Whereas the outcomes of science are present as further targets for action, for example, "sea level will rise as a consequence of not only glacier melting but also the thermal expansion of seawater" (Clim). From the several references to Climate Scenarios in the materials, their focus areas emerged as, population growth, gross-domestic production, energy consumption, and emissions (including, carbon dioxide, methane, nitrogen oxides, sulphur, and nitrogen), which predominantly seem to be related to economics, suggesting necessity and dependency on the socioeconomic processes. Although this necessity is at times addressed as an outcome of compromises, for example, "we considered both the revenue from wood sales and the volume of carbon stock in the forest" (Syst). However, such economic rhetoric seems to be cautiously accepted and normalised, rather than firmly opposed. Thus, questions like, "is market economy the cause of…?" (Sust), or "does sustainability help companies to be more profitable?" (Sust), leaves these structures ambivalent in being either the problem or a solution. Sustainability does schematically include the dimension of economic development, equal to other dimensions of sustainability and as strongly normative and universally favoured economic prosperity—but at what cost? The intent is kept undefined. Does economic prosperity always mean continuous growth—the limitless capitalisation of nature and labour? Or does it mean universal well-being—simply actualised in money? Both of these characterisations could stand as potential shorthand examples of the current economic system.

Utilising the concept of eco-social systems, rather than strictly environmental, is often suggested as a backdrop to environmental problems, such as, "There are many situations in the real world in which identifying an eco-social system may help us to better understand and address an environmental problem" (Syst). Under the broad *targeting* in the human-nature linkages, economic activities take centre stage, although they are often presented as a solution rather than a problem, for example, "Understand the problems of today's consumption of resources and how the circular economy can help in resolving these problems" (Circ). Sometimes they are presented as an issue that can be cured from the current unsustainability, "examine the current use of resources and the challenges that give rise to, and also familiarise ourselves with the circular economy model" (Circ). Under the themes of Circular Economy industries that are typically problematised, such as fashion and tourism, are presented as targets. Other targets that were regularly mentioned include topics like forest-based cycles, technical cycles, mobility, sharing economy, agriculture, and food systems. Another key area that emerged was systems, for example, energy in the sociotechnical systems, "The transition away from fossil fuels presents several challenges for energy systems" (Clim). Herein, issues like mobility appear as an important change-target, "What benefits (and possible disadvantages) from changes in mobility habits and means of transport could you, society/consumers and sustainability experience?" (Circ). In general, systems theories, like the Multi-Level Perspective Theory or conceptualisations like Wicked Problems are frequent approaches.

Biodiversity is also frequently a theme, especially on its respective course, with such relevant insights, including, "understanding the importance of biodiversity and consequences of biodiversity loss, threats to biodiversity" (Biod). Biodiversity gets nested within other problem-areas that have targets, which also appear as structures for solutions, including, "circular economy, ecological compensation, biodiversity and business" and "political and economic tools in biodiversity conservation, biodiversity politics, biodiversity and civic movements". Although it should be noted that the politics—or policies and power in general—are seldom mentioned but do appear on occasion, "steering instruments and measures could promote the circular economy" (Circ). Sometimes they come up even more directly through questions like, "What are the power relationships between the different actors?" (Syst). Politics are also brought into the conversation through questions that acknowledge the linkages between human action and several issues related to climate and sustainability, "In whose advantage it is to pretend that climate change has not been caused by humans?" (Clim) The human is habitually addressed as the solution to the current unsustainable state of the world, "humans as agents of change in systems that link individuals and groups of people with the environments" (Syst). Humans are a prime activity target, due to their social existence and professional practices—as private, public, or citizen sector representatives. Yet, it

is the very nature of human action—reifying the structure—that needs to be changed. This can be seen with statements and questions like, "Achieving the 1.5 Celsius target means companies also need to take action" (Clim) or "What are the competencies needed for the society to reach carbon neutrality by 2035?" (Clim).

In this vein of thought, the often-mentioned stakeholders appear as a structure-resource. Stakeholders are sometimes addressed at times as co-creators, that is actors that shoulder more of the collaborative burden, and at times as a group who is to be convinced to collaborate. Stakeholders, as an example of *the others* (mentioned more explicitly in the Discussion and Conclusions section), expresses more features of a structure, than an actor. Their utility is in the outcome, as their acts are concretised in reified structures. However, one's actions are simultaneously the very agency-structure, meaning that they can also appear as structures of change. For example, statements like, "Explore the environmental changes and challenges in and around your own professional field, studies, or a field of your own personal interest" (Lead), suggest that, regardless of the field, one can exercise their transformative potential through professional acts. Although even one's own acts are targets of change, whether this is reflected by specific choices, "How much land you must own to be able to make a carbon-free trip…" (Clim), or in general exploration, "How can you contribute towards sustainable futures?" (Sust). Self-steering, as a foundation of agency, is often called for in further redefining the problems and exploring the potential solutions, "what [do you think] is the challenge?" (Lead) and "what needs to change?" (Lead). However, in expecting the people to define the problems, and in addressing people as the cause and source of the issues, two ideas emerge—othering and externalisation. The rhetoric makes a distinction between *humans,* who act unsustainably for the lack of proper knowledge and a class of *us* knowledgeable humans. This can be seen in statements like, "our agency as individuals and as a group" (Sust). It is this latter group of knowledgeable humans who are seen as the potential solution. At times, the human is external, "How much were the carbon emissions produced by humanity?" (Clim). While at other times the human or some human, can also change, "Our economic development has drastically changed the way we live, but it has also brought with it complex and difficult problems that necessitate global action to be solved" (Lead). Although similar externalisation through drawing rhetorical boundaries can be seen when addressing the environment in general. Forests are imagined through their utility—they are either cut for their material or left to serve as carbon sinks. Similarly, animals are cast as needing rescue, "How endangered are they and how does the media affect your perceptions about them?" (Comm).

4.3 Action—enacting a sustainability transformation

Although the agency dimension of structuration theory is the most explored dimension in sustainability rhetoric and education, it is relevant to further examine it through these materials, which go beyond the stage and structure. In general, agents are assumed to be familiar with the main concepts of sustainability. Sustainability is addressed through its dimensions, as a political, normative, and at times *conflicted* concept. It appears to have endless(ly) (re)defined wicked and systemic problems related (mostly) to climate, which serves as the main foundation for the calls for stakeholder collaboration. Again, the materials follow the commonplace rhetoric of sustainability, further demonstrating the general nature of materials used in this content analysis. With multiple definitions and descriptions of sustainability, the epistemic plurality is also addressed in reflecting differing worldviews, that is the identities, hopes, and obstacles for furthering sustainability. Repeating typical sustainability rhetoric, multi- and interdisciplinarity are often referenced, especially in course assignments, moreover in the frequently utilised group work processes. The plurality of sustainability is also manifested through the numerous employed and suggested methodologies which describe the knowledge of the actor as well. Some basic parameters of the learned content on these courses are given, such as "sustainable development as a political and normative concept […] its ecological, social, economic and cultural dimensions and the connections and conflicts related […] the wicked problems related to it […] require multidisciplinary cooperation and problem-solving skills" (Sust). This could also be seen as leading to the generalisation of sustainability agents.

Agency is often directly referenced in the materials and sustainability rhetoric, for example, "The course also emphasises the importance of agency and the different roles of an individual. […] on the other hand, sustainability and climate challenges are also presented as structural and systemic problems" (Sust). Thus, it is rarely explicitly connected to structures. Instead, agency is seen as a conceptualisation of an actor with an—often ideological—goal to be changed. Under this characterisation, this actor could be described as more of a professional activist, rather than an actor who is always functioning solely within structures. These agent-actors are primed to be the enablers and drivers of change and as such they are cast as responsible for enacting widespread sustainability. Reflections on the educated understanding of sustainability—contextualised to an organisation or community—appear as a conceptualisation of sorts of the transformative potential an actor can possess by virtue of existing in several societal spheres. Such contextualisation of

one's own intersectional acts naturally coincides with the previously noted stage for sustainability and the previously noted targets, which occur in real-world cases. Such real-world cases appear at times as lessons from what has been done, for example, "Find an example of a successful (or unsuccessful) conservation effort" (Biod). This approach can be paired with mounting challenges, which serve to exercise critical sustainability thinking, such as "What was the situation before conservation efforts and after? How did conservation efforts affect species/ecosystem biodiversity?" (Biod). Alternatively, agents are asked to reflect on their agency, which often puts them into the role of a consumer rather than simply an aware citizen, "how much domestic water does each person in Finland use per day" (Clim). At times the agents are asked to reflect on their own intersectionality within the broader landscape of sustainability schemes, "Think of your roles in a circular economy circle: as a consumer, as a citizen and as a (future) professional working in an organisation of sorts" (Lead).

Agency, as in the previous examples, suggests a professional role. Professionalism is predominantly defined by the actor's expertise, which is constructed through know-how and capabilities—often cited as competencies. Competencies for sustainability include such traits as systems thinking and analytical thinking, which appear in the materials, "From why sustainability is taught, we move to how it is taught, and to what is taught: the competencies for sustainability" (Lead). Although systems thinking is often mentioned not just as a competence but as a process, approach, and requirement, "System-level thinking ensures that we do not, while mitigating climate change, upset other systems and create new problems, for example for nutrient cycle or biodiversity" (Clim). Another competence that appeared often is critical thinking, which manifests as both critical reflections, and by generally adopting a critical approach. Critical thinking is called for in many different scenarios, "In whose advantage it is to pretend that climate change has not been caused by humans?" (Clim), and "What benefits do actors gain from connecting their activities to and categorising them as Circular Economy? Are there any risks?" (Lead).

These competencies are interconnected, and they also overlap in practice, for example, "When we understand Climate Change as a systemic phenomenon, i.e. as the product of a certain system of connections between things, we unlock a powerful set of tools for making sense of it–systems thinking" (Syst). In other words, systems thinking features analytical and normative traits as well. Interpersonal competencies are also commonly referenced, especially as part of communication, which is a key theme in sustainability-making. Communication, taken in its simplest interpretation as conveying a message, still requires specific competences. Additionally, communication is practised through different media—from written reports to conference appearances, and academic publications to private discussions—all of which have their own dilemmas, such as that of normativity, "What should be taken into account when communicating about climate change […] What kind of rhetoric would be appealing?" (Comm), or "How can we make people care about "unpopular" endangered species?" (Biod). Related to the act of conveying a message, the utilisation of knowledge (and science as an outcome) is cited as an important competence; for example, in argumentation. Language is also mentioned as an important tool and capability to express one's professionalism. Collaboration and cooperation, along with communication, are brought up as expressions of interpersonal competencies, as are project management and leadership defined as, "an influence process through which social order and change emerges" (Lead). Such operational competencies are also mentioned, including *strategic competence, initiative competence* (for example in furthering goals and taking responsibility), and *creative competence* (for example creatively combining knowledge of different fields).

Different from competencies, various skills emerge repeatedly in the materials, with a special emphasis on skills that relate to certain methodologies; such as, climate modelling, future casting techniques, creative problem-solving tools, prototyping, participatory methods, impact assessment and analysis tools like circular economy cob-web charts or multi-criterion analysis/comparison charts, and utilising different knowledge databases such as Red List Data Books. It should be noted that methodological skills for environmental sciences seem to be addressed quite descriptively, for example "…we ask you to consider the phosphorus cycle from the perspective of its effects on the Baltic Sea" (Syst), or "changes in the Earth System being produced by Climate Change" (Syst). The former has more of a normative slant, while the latter seems semantically different from attributing the changes to human causes. Methodological strategies for Climate Change are scarcely mentioned, with only a few examples, such as, "what kinds of climate engineering (geoengineering) techniques are being developed to mitigate climate change" (Clim). Statements like this were often accompanied by further examples that expanded on how to mitigate the changes. However, actual adaptation strategies seldom appeared, "The changes will have adverse effects, which we can reduce by adapting to the changes" (Clim). Yet another class of capabilities, as material constructs for agency can be seen, for example, in addressing Circular Economy to "create a vision of practical activities that could be undertaken by different sectors to promote the circular economy" (Circ). Thus, utilising Circular Economy as a structure for agency-acts to take place. Design-thinking, along with other approaches related to *how things should be*, like solution innovations through products or services, or social innovations

like practices or habits are suggested as interventions to the current state of unsustainability. Imagination and artistic approaches are also suggested to lead to novel, potentially effective, and transformative outcomes, "Imagine change towards more sustainability in the practices of an organisation of your choice" (Lead).

Emotions appear related to working with climate change and sustainability, where thoughts like the following are mentioned, "climate anxiety", "climate wishful thinking", and "seeking for balance between realism and hope" (Comm). Values emerge, for example, through one's own environmental or ethical principles and seem directly tied to the motivation of the agents. Values, related to emotions, also appear highly relevant for employing the agent's transformative capability, where knowledge in decision-making relates more to reason. Values affect the personal, historical, and cultural stance towards sustainability, prompting questions like what is the"*meaning of sustainability for me*?" (Solu). Thus, values are part of personal reflection influencing one's choices. Values are found where facts turn into knowledge and potentially to action. Thus, some notions were quite common, such as coping with uncertainty and leading and making bold decisions with uncertain outcomes.

5 Discussion and conclusions

This analysis adapted and employed Structuration Theory as a theoretical framing for critically assessing approaches to sustainability transformation that were expressed in climate change and sustainability-themed educational materials from Climate University. The materials in the textual corpus were presented as a micro-study and an example of contemporary sustainability rhetoric. These materials represent one approach to the themes, and although the various courses were authored by a vast interdisciplinary network, citing multiple strands of research, they do not—even when taken together—express all the possible problematisations of sustainability. However, to evoke discussion over the utility of Structuration Theory, the presented results bring novel insight into the concept of sustainability agency, which has largely been disconnected from structure, regardless of the specific problematisation. Sustainability and its problematisations in this context are observed through the lens of structuration, which is essentially a view of sustainability as a process and serves as a foundation for our emergent insights. We aim to discuss our findings and contribute insights related to sustainability education [24], professionalism [72], and as practices of transformative sustainability [55].

The materials include persistent boundary-work and highlight ontological positioning—similar to other juxtapositions present in the concept of sustainability—for example, between generalists and specialists, mono- and interdisciplinary, business-as-usual, and transformation [72]. The observation of this practice is highly relevant, for example, when crafting the ideals of sustainability agency, which should serve as the basis for the education and identity of sustainability. This boundary-work can be seen when referencing how knowledgeable the agent is when justifying their relevance and authority, or in exemplifying the normativity of sustainability when assessing and changing practices or systems that are deemed unsustainable (reflected in Fig. 2). The narratives revolve around the hubris-like normative contrasting between what is considered sustainable or unsustainable predominantly to consumers, for example, *animal-based* vs. *vegan* produce [14]. These contrasts become rhetorical bridges connecting subjects to ideological shelters, like *our climate-friendly diet*, or those where there is a disconnect, like *peoples' meat consumption*. The contrasting ideologies are futile as agents—in this case, consumers—are left to exercise their dominance between a comparatively *more* sustainable choice and an unsustainable choice. There is an issue of creating boundaries between *us* as *humans*, and *others* as *nature* and generally for making sense of the existing structures in which the capable and responsible agents are supposed to enact the change [21]. Certain unsustainably actions and systems are sometimes perceived as necessary and seem to exist under a level of acceptance, like economic prosperity through maximisation of resource utility (for example, by maximising forest utility for carbon storage businesses). This is perhaps because of the same *othering*—their benefits that are considered mutual on both opposing sides [31]. It is a worthy concern that such ontological constructs, for example,

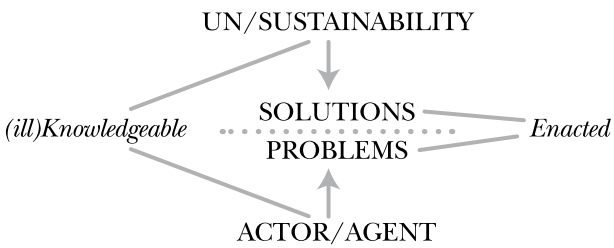

Fig. 2 The rhetorical othering and boundary-work can instantaneously address (ill) knowledgeable actors to enact problems as unsustainability, address knowledgeable agents as solutions of sustainability, or create different combinations of them

as *me* to *people,* could lead to *us* versus *others* (even in the verbiage of this article), and thus simply considering sustainability as a virtue of the resourceful few, rather than a systemic nature of humanity's existence. Thus, an explicit narration of the existing unsustainability is required to also profoundly address sustainability—perhaps beyond the language of binary expressions like *us* or *others*.

Acts follow structure, and ultimately (re)create them in a continuous flow [68]. Acts either reaffirm or transgress the other actors' structures—especially in the case of sustainability transformation—leading to a conclusion that *others* in practice appear as structure, rather than agents. Although, others—the (differently, or ill) knowledgeable [48] or the competent [33]—affirm the agency-structure as their acts reject or reify the alternatively enacted structures. Others in their agency also represent a form of structural power, which can dominate the instilled reality—that is the enacted social structure at large. Ultimately, it is against this instilled reality that educated agents are expected to transgress the known path (i.e., indicative of path dependency). Considering the prevalence of structuration, this theory ostensibly proposes a psychosocial vacuum, in which acts reify and agency transforms the structure, which perpetually suggests that there are potentials and opportunities for sustainable alternatives by finding alternatives to the structures. Therefore, the consideration of the educational application of these realisations would suggest that in addition to the educated agents being knowledgeable of sustainability as the direction to which the change is to happen, they ought to be as knowledgeable of the structures in which they aim to operate the changes. Furthermore, they should be aware of the highly probable incompatibility and resistance the given structures will most likely have towards the change they aim to make. Rather than seeing this as a limitation, it ought to be an inspiration to the education and professionalism, for example, when considering different strategies to manage resistance and to overcome the barriers to their professional expertise and agency.

Considering the intended overarching societal impact, agency-work—even if infrequent—can create rhythmic shifts, which can be seen as micro-level changes, which in turn affect the meso-level structures and meta-level landscape in Multi-level Perspective Theory [59]. This can also be interpreted as seeking for reaffirmation through other agents in Actor-Network Theory [58]; thus, suggesting at least one functional linkage between these theories. Agency is an attribute of the increased actor qualities one *possesses*—the knowledge(s) attained and utilised for transformative capability (as the main argument for sustainability education), yet it is only a capacity if there is domination over the employable resources (Fig. 1). By such rhetoric, agency alone appears as surprisingly trivial, since knowledge in itself has weak power and the potential to act and as it is assigned to *virtually everyone*—rendering it as such seemingly insignificant. Thus, there needs to be an understanding—as better disseminated in sociological thought—that agency alone is insufficient in transition theories, while the much sought-after capacity to transform lies in the duality of agency and structure, but the function or the capacity is actualised through concrete resources [51]. However, the relevance of this suggested sustainability structuration for education and educational institutions comes in a few different forms. Sustainability educators ought to pay much more attention to structuration as a broader concept of knowledgeable agents in structures of actions [50], the existing cultural and societal paradigm [55], power [12], and to the instilled reality thereof [65], as these are the paths of dependency. Although, the utility of this outcome is perhaps not directly found in specific curriculum or intended learning outcomes per se, but it is in considering the very approach suggested herein. For example, in suggesting one to simply enact universal sustainability by its values and principles within the given structures that are most likely not sustainable—and most likely for a reason—the suggestion ought to approach sustainability as situational and contextual. In addition, there should be a careful consideration of the utilisable values and principles in the given context that could be aligned with the aims of the sustainability in question. Thus, a key outcome of this study is the recommendation to educators to extend and explore their conceptualisation of agency to envelope the structures as they exist in a systemically unsustainable society—emerging as sustainability structuration.

In addition to the limitations mentioned in the Materials and Methods section (for example, on reliability—somewhat covered by utilising publicly available materials, and on generalisability—justified by reciting commonplace sustainability rhetoric) as a qualitative study there are other potential limitations that must be mentioned. Our outcomes, sourcing from constructive methodologies and interpretive methods, are subject to personal biases and are limited to the materials of the research and the researcher's comprehension of the topics addressed. This research was based on publicly available texts and well-known and articulated theories; thus, aiming for better transparency and reliability. As previously mentioned, one ought to consider this to be a micro-study of sorts, although to our expertise, the relevance of this work, comes specifically from the generalisability of the material content. However, these limitations ought to inspire future research on these themes, especially the possibility to further contextualise sustainability structuration in education and professional practice. Further research should reevaluate our current approaches to the practised sustainability beyond the at-times overemphasised capacities of agents or the belittled importance of structures. This ought

to be done at first in the field of sustainability education within the institutional structures, utilising the transformative capacity of researchers and educators to enact their approach, for example, on a curricular or thematic level.

In conclusion, the significant content of this study, as descriptions of sustainability structuration, focus on explaining sustainability as an endeavour, a structure, and agency. Sustainability is constructed through the typical dimensions and thematised in different schemes like SDGs and problematised by conceptualisations like biodiversity-loss or climate change scenarios. To this end, scientific disciplines, fields of application, personal values, and—at times hegemonic—normativity of sustainability significantly influence our understanding and approach to enacting sustainability. Systems can be taken as contexts and targets for sustainability to be embedded in or take a systemic approach to one's abilities and capabilities, for example, the competencies and resource-oriented methodologies that experts need. While the rhetoric citing difficulties in achieving sustainability prevails, a narration exists simultaneously of agency through one's roles and knowledgeable actions to change. However, a rhetorical process of *othering* looms where sustainability is performed, making other *people* the cause of the sustainability crises, while suggesting *self* and *us* to be the solution. Importantly, there is relevance to address the *othering* in the concept of sustainability structuration, as in practice other agents and actors materialise as structure. Thus, the most relevant abstraction of this study aims to illustrate the somewhat mistakenly accepted capability of an actor—even as a knowledgeable, educated agent—depends on the domination of resources, which is the capacity in concert with structure wherein the transformation can be enacted. By this we mean that for sustainability to be enacted, it cannot be decided at the will of a sole agent, but rather it is always in a culture of sustainability. In educational practice, sustainability structuration implies, for example on a curricular level, that the intended knowledgeability of the educated agent consists as much of understanding the current situation of unsustainability within the given context, as it does of the envisioned ideal sustainability that at times can appear as the predominant focus. It is either by sovereign resource dominance, near society-wide aligned co-agency, or the ingenuity of the agents to repurpose existing structures without the mentioned dominance or collaboration, that sustainability agency (and thus the transformation) can be enacted—all theorisations relevant and perhaps even manageable through education.

Acknowledgements The authors wish to thank those several individuals with whom they have had the pleasure and privilege to converge and mature their critical thinking. In addition, we would like to thank the editors and reviewers who gave their time, attention, critical comments, and insights, all of which served to enhance this paper.

Author contributions JJS: conceptualisation, methodology, investigation, analysis, original draft preparation, writing, reviewing, and editing; SEHA: writing, reviewing, and editing.

Funding Open Access funding provided by University of Helsinki (including Helsinki University Central Hospital). This research was supported by the Research Council of Finland project, "Learning of the competencies of effective climate change mitigation and adaptation in the education system" under grant 340791. Open Access funded by Helsinki University Library.

Data availability The data that support the findings of this study are available from the author, but restrictions apply to the availability. The materials that comprise the text corpus were accessed under an agreement given to the author for this study and are not publicly available. However, the data is available from the author upon reasonable request and with the permission of the responsible parties.

Declarations

Competing interests The authors report there are no competing interests.

References

1. Salvia AL, Leal Filho W, Brandli LL, Griebeler JS. Assessing research trends related to sustainable development goals: local and global issues. J Clean Prod. 2019;208:841–9. https://doi.org/10.1016/j.jclepro.2018.09.242.

2. Fleig A, Tosun J. Political parties' rhetoric signaling of sustainable development. Sustain Dev. 2017;25(5):431–42. https://doi.org/10.1002/sd.1672.
3. Chasek PS, Wagner LM, Leone F, Lebada AM, Risse N. Getting to 2030: negotiating the post-2015 sustainable development agenda. Rev Eur Compar Int Environ Law. 2016;25(1):5–14. https://doi.org/10.1111/reel.12149.
4. Echebarria C, Barrutia JM, Eletxigerra A, Hartmann P, Apaolaza V. Local sustainability processes worldwide: a systematic review of the literature and research agenda. J Environ Planning Manage. 2018;61(8):1289–317. https://doi.org/10.1080/09640568.2017.1342611.
5. Garnett ST, Lawes MJ, James R, Bigland K, Zander KK. Portrayal of sustainability principles in the mission statements and on home pages of the world's largest organizations. Conserv Biol. 2016;30(2):297–307. https://doi.org/10.1111/cobi.12617.
6. Buerke A, Straatmann T, Lin-Hi N, Müller K. Consumer awareness and sustainability-focused value orientation as motivating factors of responsible consumer behavior. RMS. 2017;11:959–91. https://doi.org/10.1007/s11846-016-0211-2.
7. Hallinger P, Chatpinyakoop C. A bibliometric review of research on higher education for sustainable development, 1998–2018. Sustainability. 2019;11(8):2401. https://doi.org/10.3390/su11082401.
8. Trencher G, Yarime M, McCormick KB, Doll CN, Kraines SB. Beyond the third mission: exploring the emerging university function of co-creation for sustainability. Sci Public Policy. 2014;41(2):151–79. https://doi.org/10.1093/scipol/sct044.
9. Shove E, Spurling N. Sustainable practices: social theory and climate change. In: Sustainable Practices. 2013: 1–13. Routledge.
10. Salovaara JJ, Soini K. Educated professionals of sustainability and the dimensions of practices. Int J Sustain High Educ. 2021;22(8):69–87. https://doi.org/10.1108/IJSHE-09-2020-0327.
11. Miller TR, Wiek A, Sarewitz D, Robinson J, Olsson L, Kriebel D, Loorbach D. The future of sustainability science: a solutions-oriented research agenda. Sustain Sci. 2014;9:239–46. https://doi.org/10.1007/s11625-013-0224-6.
12. Feola G. Societal transformation in response to global environmental change: a review of emerging concepts. Ambio. 2015;44(5):376–90. https://doi.org/10.1007/s13280-014-0582-z.
13. Davelaar D. Transformation for sustainability: a deep leverage points approach. Sustain Sci. 2021;16(3):727–47. https://doi.org/10.1007/s11625-020-00872-0.
14. Luederitz C, Abson DJ, Audet R, Lang DJ. Many pathways toward sustainability: not conflict but co-learning between transition narratives. Sustain Sci. 2017;12:393–407. https://doi.org/10.1007/s11625-016-0414-0.
15. Barth M, Rieckmann M. State of the art in research on higher education for sustainable development. In: Routledge handbook of higher education for sustainable development. 2016: 100–113.
16. Ferrer-Balas D, Lozano R, Huisingh D, Buckland H, Ysern P, Zilahy G. Going beyond the rhetoric: system-wide changes in universities for sustainable societies. J Clean Prod. 2010;18(7):607–10. https://doi.org/10.1016/j.jclepro.2009.12.009.
17. Gajparia J, Strachan G, Leverton K. Transformation through learning: education about, for, and as sustainability. Fronti Sustain. 2022;3:982718. https://doi.org/10.3389/frsus.2022.982718.
18. Thorén H, Breian L. Stepping stone or stumbling block? Mode 2 knowledge production in sustainability science. Stud History Philos Sci Part C. 2016;56:71–81. https://doi.org/10.1016/j.shpsc.2015.11.002.
19. Lozano R, Lozano FJ, Mulder K, Huisingh D, Waas T. Advancing higher education for sustainable development: international insights and critical reflections. J Clean Prod. 2013;48:3–9. https://doi.org/10.1016/j.jclepro.2013.03.034.
20. Haider LJ, Hentati-Sundberg J, Giusti M, Goodness J, Hamann M, Masterson VA, Sinare H. The undisciplinary journey: early-career perspectives in sustainability science. Sustain Sci. 2018;13:191–204. https://doi.org/10.1007/s11625-017-0445-1.
21. Heiskanen E, Thidell Å, Rodhe H. Educating sustainability change agents: the importance of practical skills and experience. J Clean Prod. 2016;123:218–26. https://doi.org/10.1016/j.jclepro.2015.11.063.
22. Stewart R, Bey N, Boks C. Exploration of the barriers to implementing different types of sustainability approaches. Procedia CIRP. 2016;48:22–7. https://doi.org/10.1016/j.procir.2016.04.063.
23. Buckler C, Creech H. Shaping the future we want: UN decade of education for sustainable development; final report. Unesco. 2014.
24. Brundiers K, Barth M, Cebrián G, Cohen M, Diaz L, Doucette-Remington S, Zint M. Key competencies in sustainability in higher education—toward an agreed-upon reference framework. Sustain Sci. 2021;16:13–29. https://doi.org/10.1007/s11625-020-00838-2.
25. Moilanen F, Toikka A. Measuring employees' perceptions of sustainability transitions at work: a novel survey with findings from Finland. Discover Sustainability. 2023;4(1):45. https://doi.org/10.1007/s43621-023-00163-5.
26. Wieczorek AJ. Sustainability transitions in developing countries: major insights and their implications for research and policy. Environ Sci Policy. 2018;84:204–16. https://doi.org/10.1016/j.envsci.2017.08.008.
27. Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, Lang DJ. Leverage points for sustainability transformation. Ambio. 2017;46:30–9. https://doi.org/10.1007/s13280-016-0800-y.
28. Hansmann R, Mieg HA, Frischknecht P. Principal sustainability components: empirical analysis of synergies between the three pillars of sustainability. Int J Sust Dev World. 2012;19(5):451–9. https://doi.org/10.1080/13504509.2012.696220.
29. Longo SB, Isgren E, Clark B, Jorgenson AK, Jerneck A, Olsson L, York R. Sociology for sustainability science. Discov Sustain. 2021;2:1–14. https://doi.org/10.1007/s43621-021-00056-5.
30. Moore JW. Capitalism in the Web of Life: Ecology and the Accumulation of Capital. Verso Books. 2015.
31. Hammond M. Democratic deliberation for sustainability transformations: between constructiveness and disruption. Sustain Sci Pract Policy. 2020;16(1):220–30. https://doi.org/10.1080/15487733.2020.1814588.
32. Brundiers K, Wiek A. Beyond interpersonal competence: teaching and learning professional skills in sustainability. Education Sciences. 2017;7(1):39. https://doi.org/10.3390/educsci7010039.
33. Wiek A, Withycombe L, Redman CL. Key competencies in sustainability: a reference framework for academic program development. Sustain Sci. 2011;6:203–18. https://doi.org/10.1007/s11625-011-0132-6.
34. Cebrián G, Junyent M, Mulà I. Competencies in education for sustainable development: emerging teaching and research developments. Sustainability. 2020;12(2):579. https://doi.org/10.3390/su12020579.
35. Lozano R, Barreiro-Gen M, Lozano FJ, Sammalisto K. Teaching sustainability in European higher education institutions: assessing the connections between competences and pedagogical approaches. Sustainability. 2019;11(6):1602. https://doi.org/10.3390/su11061602.

36. Redman A, Wiek A. Competencies for advancing transformations towards sustainability. In: Frontiers in Education. 2021: 6; 785163. Frontiers Media SA. https://doi.org/10.3389/feduc.2021.785163
37. Martin S, Brannigan J, Hall A. Sustainability, systems thinking and professional practice. J Geogr High Educ. 2005;29(1):79–89. https://doi.org/10.1080/03098260500030389.
38. Jalas M, Hyysalo S, Heiskanen E, Lovio R, Nissinen A, Mattinen M, Nissilä H. Everyday experimentation in energy transition: a practice-theoretical view. J Cleaner Product. 2017;169:77–84. https://doi.org/10.1016/j.jclepro.2017.03.034.
39. Shove E. Putting practice into policy: reconfiguring questions of consumption and climate change. Contemporary Social Science. 2014;9(4):415–29. https://doi.org/10.1080/21582041.2012.692484.
40. Welch D, Yates L. The practices of collective action: Practice theory, sustainability transitions and social change. J Theory Soc Behav. 2018;48(3):288–305. https://doi.org/10.1111/jtsb.12168.
41. West S, van Kerkhoff L, Wagenaar H. Beyond "linking knowledge and action": towards a practice-based approach to transdisciplinary sustainability interventions. Policy Studies. 2019;40(5):534–55. https://doi.org/10.1080/01442872.2019.1618810.
42. Thomas I, Barth M, Day T. Education for sustainability, graduate capabilities, professional employment: How they all connect. Aust J Environ Educ. 2013;29(1):33–51. https://doi.org/10.1017/aee.2013.14.
43. Avelino F, Wittmayer JM. Shifting power relations in sustainability transitions: a multi-actor perspective. J Environ Planning Policy Manage. 2016;18(5):628–49. https://doi.org/10.1080/1523908X.2015.1112259.
44. Chan KM, Boyd DR, Gould RK, Jetzkowitz J, Liu J, Muraca B, Brondízio ES. Levers and leverage points for pathways to sustainability. Peopl Nat. 2020;2(3):693–717. https://doi.org/10.1002/pan3.10124.
45. Koistinen K, Teerikangas S, Mikkilä M, Linnanen L. Active sustainability actors: a life course approach. Sustain Dev. 2020;28(1):208–23. https://doi.org/10.1002/sd.1989.
46. Scoones I, Stirling A, Abrol D, Atela J, Charli-Joseph L, Eakin H, Yang L. Transformations to sustainability: combining structural, systemic and enabling approaches. Curr Opin Environ Sustain. 2020;42:65–75. https://doi.org/10.1016/j.cosust.2019.12.004.
47. Fischer LB, Newig J. Importance of actors and agency in sustainability transitions: a systematic exploration of the literature. Sustainability. 2016;8(5):476. https://doi.org/10.3390/su8050476.
48. Birdman J, Barth M, Lang D. Connecting curricula and competence through student learning journeys. Sustain Sci Pract Policy. 2022;18(1):560–75. https://doi.org/10.1080/15487733.2022.2097773.
49. Farla JCM, Markard J, Raven R, Coenen LE. Sustainability transitions in the making: a closer look at actors, strategies and resources. Technol Forecast Soc Chang. 2012;79(6):991–8. https://doi.org/10.1016/j.techfore.2012.02.001.
50. Teerikangas S, Onkila T, Koistinen K, Mäkelä M. (Eds.). Research handbook of sustainability agency. Edward Elgar Publishing. 2021
51. Koistinen K, Teerikangas S. The debate if agents matter vs. the system matters in sustainability transitions—a review of the literature. Sustainability. 2021;13(5):2821. https://doi.org/10.3390/su13052821.
52. Visser W, Crane A. Corporate sustainability and the individual: understanding what drives sustainability professionals as change agents. Available at SSRN. 2010. https://doi.org/10.2139/ssrn.1559087.
53. Woodward R, Feldman I, Edwards M. The sustainability professional: 2010 competency survey report. 2010.
54. Carollo L, Guerci M. 'Activists in a suit': paradoxes and metaphors in sustainability managers' identity work. J Bus Ethics. 2018;148:249–68. https://doi.org/10.1007/s10551-017-3582-7.
55. McGeown C, Barry J. Agents of (un) sustainability: democratising universities for the planetary crisis. Front Sustain. 2023;4:1166642. https://doi.org/10.3389/frsus.2023.1166642.
56. Köhler J, Geels FW, Kern F, Markard J, Onsongo E, Wieczorek A, Wells P. An agenda for sustainability transitions research: state of the art and future directions. Environ Innovat Soc Transit. 2019;31:1–32. https://doi.org/10.1016/j.eist.2019.01.004.
57. Laakso S, Aro R, Heiskanen E, Kaljonen M. Reconfigurations in sustainability transitions: a systematic and critical review. Sustain Sci Pract Policy. 2021;17(1):15–31. https://doi.org/10.1080/15487733.2020.1836921.
58. Latour B. Reassembling the social: an introduction to actor-network-theory. Oup Oxford. 2007.
59. Geels FW. Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective. Curr Opin Environ Sustain. 2019;39:187–201. https://doi.org/10.1016/j.cosust.2019.06.009.
60. Shove E, Pantzar M, Watson M. The dynamics of social practice: Everyday life and how it changes. Sage. 2012.
61. El Bilali H. The multi-level perspective in research on sustainability transitions in agriculture and food systems: a systematic review. Agriculture. 2019;9(4):74. https://doi.org/10.3390/agriculture9040074.
62. Moradi A, Vagnoni E. A multi-level perspective analysis of urban mobility system dynamics: What are the future transition pathways? Technol Forecast Soc Chang. 2018;126:231–43. https://doi.org/10.1016/j.techfore.2017.09.002.
63. Walrave B, Talmar M, Podoynitsyna KS, Romme AGL, Verbong GP. A multi-level perspective on innovation ecosystems for path-breaking innovation. Technol Forecast Soc Chang. 2018;136:103–13. https://doi.org/10.1016/j.techfore.2017.04.011.
64. Elder-Vass D. Searching for realism, structure and agency in actor network theory1. Br J Sociol. 2008;59:455–73. https://doi.org/10.1111/j.1468-4446.2008.00203.x.
65. Bhaskar R. On the possibility of social scientific knowledge and the limits of naturalism. J Theory Soc Behav. 1978;8(1):1–28.
66. Archer M. Being human: the problem of agency. Cambridge Univer Press. 2000. https://doi.org/10.1017/CBO9780511488733.
67. Miller TR, Baird TD, Littlefield CM, Kofinas G, Chapin III FS, Redman CL. Epistemological pluralism: reorganizing interdisciplinary research. Ecol Soc. 2008: 13(2). https://www.jstor.org/stable/26268006
68. Giddens A. Central problems in social theory: action, structure, and contradiction in social analysis, volume 241 of campus: University of California Press. 1979.
69. Giddens A. The consequences of modernity. Cambridge: Polity; 1990.
70. Whittington R. Giddens, structuration theory and strategy as practice. In D. Golsorkhi, L. Rouleau, D. Seidl, and E. Vaara (Eds.), Cambridge Handbook of Strategy as Practice (pp. 145–164). Cambridge University Press. 2015. https://doi.org/10.1017/CBO9781139681032.009
71. Eteläpelto A, Vähäsantanen K, Hökkä P, Paloniemi S. What is agency? Conceptualizing professional agency at work. Educ Res Rev. 2013;10:45–65. https://doi.org/10.1016/j.edurev.2013.05.001.

72. Salovaara JJ. Sustainability alumni at work—interviews on educated sustainability professionalism. Sustainability. 2022;14(22):14774. https://doi.org/10.3390/su142214774.
73. Feola G. Capitalism in sustainability transitions research: time for a critical turn? Environ Innov Soc Trans. 2020;35:241–50. https://doi.org/10.1016/j.eist.2019.02.005.
74. Leydesdorff L. The communication of meaning and the structuration of expectations: Giddens'"structuration theory" and Luhmann's "self-organization". J Am Soc Inform Sci Technol. 2010;61(10):2138–50. https://doi.org/10.1002/asi.21381.
75. Fuchs S. Beyond agency. Soc Theory. 2001;19(1):24–40. https://doi.org/10.1111/0735-2751.00126.
76. Giddens A. A contemporary critique of historical materialism (Vol. 1). Univ of California Press. 1981.
77. Schneidewind U, Augenstein K, Stelzer F, Wanner M. Structure matters: real-world laboratories as a new type of large-scale research infrastructure: a framework inspired by giddens' structuration theory. GAIA Eco Perspect Sci Soc. 2018;27(1):12–7. https://doi.org/10.14512/gaia.27.S1.5.
78. Sewell Jr WH. A theory of structure: duality, agency, and transformation. Am J Soc. 98(1), 1–29. https://www.jstor.org/stable/2781191
79. Shilling C. Reconceptualising structure and agency in the sociology of education: structuration theory and schooling. Br J Sociol Educ. 1992;13(1):69–87. https://doi.org/10.1080/0142569920130105.
80. Baber Z. Beyond the structure/agency dualism: an evaluation of Giddens' theory of structuration. Sociol Inq. 1991;61(2):219–30. https://doi.org/10.1111/j.1475-682X.1991.tb00276.x.
81. Haderer M. Experimental climate governance as organized irresponsibility? A case for revamping governing (also) through government. Sustain Sci Pract Policy. 2023;19:1. https://doi.org/10.1080/15487733.2023.2186078.
82. Meyer JM. Experimentalism and its alternatives: toward viable strategies for transformative change and sustainability. Sustain Sci Pract Policy. 2023;19:1. https://doi.org/10.1080/15487733.2023.2166217.
83. Shapiro SP. Agency theory. Annual Rev Soc. 2005. https://doi.org/10.1146/annurev.soc.31.041304.122159.
84. Koch M. Structure, action and change: a Bourdieusian perspective on the preconditions for a degrowth transition. Sustain Sci Pract Policy. 2020;16(1):4–14. https://doi.org/10.1080/15487733.2020.1754693.
85. Climate University. http://climateuniversity.fi, Accessed 12 2022
86. Tucker B. The flipped classroom: online instruction at home frees class time for learning. Educ Next. 2012;12(1):82–4.
87. Huffman TP, Tracy SJ, Bisel RS. Beautiful particularity: Using phronetic, iterative, and heuristic approaches to a positively deviant case. Commun Res Pract. 2019;5(4):327–41. https://doi.org/10.1080/22041451.2019.1676632.
88. Krippendorff K. Content analysis: An introduction to its methodology. Sage publications. 2018.
89. Bryman A. Social research methods. Oxford University Press; 2016.