

PAPER • OPEN ACCESS

Participatory service design and community involvement in designing future-ready sustainable learning landscapes

To cite this article: N Sandström *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **297** 012031

View the [article online](#) for updates and enhancements.

Participatory service design and community involvement in designing future-ready sustainable learning landscapes

N Sandström¹, A Nevgi² and S Nenonen²

¹Campus Learning and Development Initiatives hub (Caledonia hub), Faculty of Educational Sciences, University of Helsinki, Finland

²Department of Construction Management and Economics, Research Group of Responsible Construction, Tampere University

E-mail: niclas.sandstrom@helsinki.fi

Abstract. The United Nations Sustainable Development Goals (SDGs) work as a new agenda for sustainable development globally. Many if not most of the SDGs can be combined with different levels of education. This paper leans on previous work in Sustainable Education Design (SED), which looked at sustainability from its multifaceted angles with a broad global scope. The context of the study is a campus at a research-intensive Finnish university. The methodology entailed participatory service design approaches. For piloting, one classroom was chosen as a test bed. The data consist of workshops, use walks and structured interviews. The analysis started from identifying KPIs of sustainable learning environment creation, after which these were tested against Sustainable Education Design Criteria described in a manual book earlier. The key findings include nine preliminary alternative KPIs that were merged with previous SED criteria and related SDGs. The alternative KPIs were trialled in the test bed environment. These proposed alternative KPIs can be used as indicators for sustainability, innovation and learning during participatory change processes and in evaluating the outcome.

1. Introduction

The United Nations Sustainable Development Goals (SDGs) work as a new agenda for sustainable development globally. Many if not most of the SDGs can be combined with different levels of education. The relationship between learning landscapes and SDGs is interconnected and integrated both to learning processes and built digital and physical learning environment. We use Dugdale [1] (p. 52) to define what we mean by learning landscapes:

[T]he Learning Landscape approach defines a future campus by envisioning overlapping networks of compelling places and hubs, which can offer choices to users and generate synergies through adjacencies and the clustering of facilities.

This paper leans on previous work in Sustainable Education Design (SED), which looked at sustainability from its multifaceted angles with a broad global scope. The special country focus was on Namibia [2]. The project identified various indicators (for instance, Resource Wisdom, Connectivity, Vitality, Communitarity and Recycling, see Table 1) for sustainable education, educational building and assessment thereof. It is postulated that both weak and strong sustainability [3, 4] require co-design [3] and community involvement as well as shared decision making [5] to become more tangible and to have an impact. Additionally, another related project, DOLO Learn, focuses on primary education in



Namibia, also applying the SED tool [2, 6]. The approach in this paper focuses on higher education and campus retrofitting as a means to operationalise the SDGs. In the present work, we pay attention to stakeholder participation and service design as tools to co-create learning landscapes that are attractive, healthy and sustainable.

Sustainability in our approach heavily entails social, rooted involvement that in turn produces user satisfaction and ownership in developing the campus learning landscapes further [7]. We test and develop further in a Finnish context the SED indicators and assessment tool identified earlier and presented in SED manual. The tool is a crystallisation of the levels of focus and participating stakeholders that are involved during different phases of designing and constructing educational facilities. The SED carousel is presented in Figure 1 below.

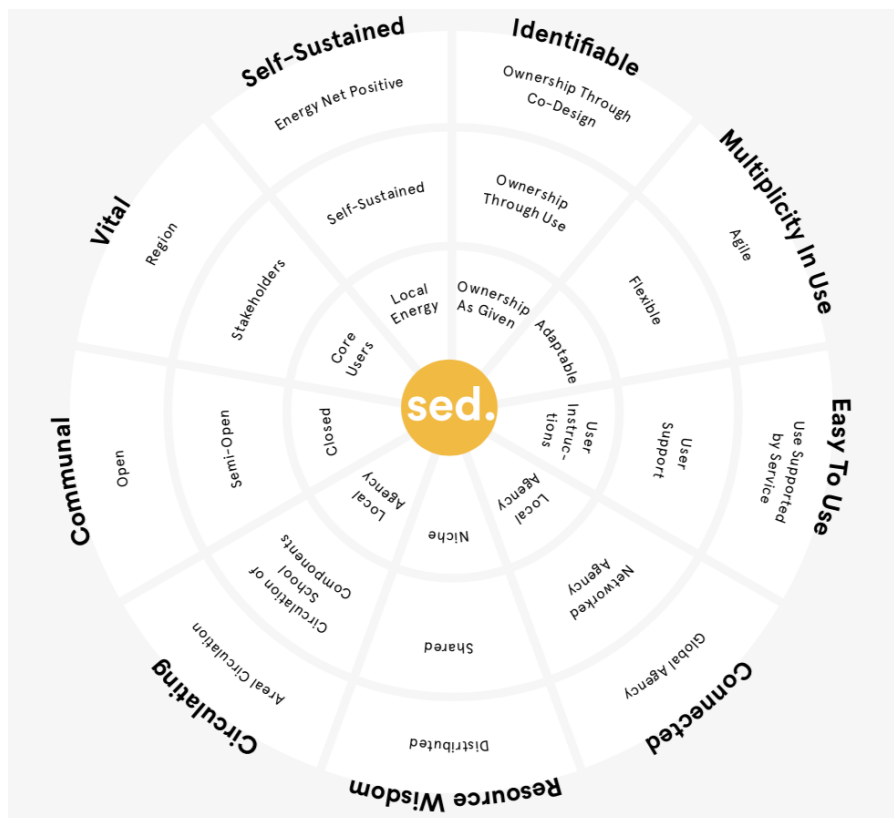


Figure 1. The SED carousel used for sustainability assessment and evaluation (Sandström & Nenonen, 2018, p. 21).

The paper concerns enhanced awareness of sustainability and how this awareness through learning in the process can be implemented in future processes in the form of culturally and socially more sustainable solutions (for instance equal possibilities to participate in the design of spaces and curricula; transparent decision-making). Universities and campuses as their concrete facilities are places for alternative and innovative ways of thinking, and thus, also places for future-proof solutions. In terms of sustainable futures, the built environment can work as a platform for increased awareness related to sustainability issues. This can take place both through the solutions that are chosen and through assessment of different aspects of the change process in the space and the impact that the changes have. The sustainability of campus retrofitting can be reinforced using participatory methods that enable community involvement and being heard of all stakeholders. The main goal in this paper was to test the framework in finding alternative Key Performance Indicators (KPIs) that can be used for sustainability considerations and learning and assessment of sustainability during campus development.

They can be applied when designing for learning landscapes and/or when evaluating the outcome, the learnings, the services produced etc. They can also promote awareness of sustainable issues in the participants - this way creating learning opportunities. As Gelfand [8, p. 22] writes regarding schools, “The qualifications necessary for planning and designing a sustainable school should include experience and skills in community outreach and community-based design.” School or educational site as campus entails dimensions that differ from many other types of buildings. Despite being outside sensitive habitat [8], the institution has a link to the surrounding environment, and can use other services and places in the neighbourhood for learning and creative collaboration.

The social/cultural dimension of sustainability [7; 9] is stressed in the present paper, although the discussion regarding which components form part of cultural sustainability [9, p. 217] is still ongoing:

Capabilities such as literacy, creativity, critical knowledge, sense of place, empathy, trust, risk, respect, recognition, to list a few, could then be understood as cultural components of sustainability.

Sustainable learning landscape is here defined being sustainable as a process (culturally, also inclusive), as a material selection, and as a learning platform: it engages users in sustainability awareness. Sustainable school architecture [8], as an example of built environment and sustainability, likewise considers communities important agents in delivering solutions and practices that promote sustainability.

As platforms for learning about and for sustainable development, schools and educational institutions are prime places because they are a major construction activity; they model long-term changes in attitudes; and they are used by entire communities. Sustainable design delivers better educational facilities. Gelfand [8, p. 18] makes a case in point in writing that

Schools that tie sustainability and education into a way of inhabiting the campus support both the running of the facility and the educational activities. As buildings and landscapes that are found in every community, schools constitute a piece of the building sector that is uniquely suited to provide leadership in sustainability.

The educational facility can thus provide both leadership about sustainability and solutions that promote communal activities with sustainability as one of the goals.

The context of the study is a campus at a research-intensive Finnish university. At the university studied here, the teachers and students have so far not had big agency in developing the learning environments. Hence, the need for participatory design and co-design to produce future-ready learning landscapes was identified early on in the process. The overarching aim of the current approach was to build alternative KPIs using participatory service design. The research question is *what kinds of alternative KPIs can promote the design of future-ready and sustainable campus learning landscapes.*

2. Method

For piloting the participatory service design process, one classroom K113 was chosen as a test case because of its known problems and general undesirability. The aim of the participatory design was to retrofit the classroom K113. During the participatory service design the key stakeholders were involved into the process by interviews ($N = 19$; FM, teaching personnel and students), and by 4 participatory workshops and user journeys. The participatory workshops were recorded and transcribed verbatim. The interviews and user journeys were not recorded but the notes of the interviews were written by 2-3 interviewers and combined immediately after the interviews and user journeys. The data were mirrored against the SED indicators and the SED assessment tool (see Figure 1), testing and validating the tool

further. The test case classroom is a pilot that will be scaled up in other campus contexts after analysis and conclusions about the process and feasibility of the outcomes in this study.

2.1. The Interviews

The key *stakeholders* were chosen so that they would represent all the groups involved in *using or managing the facilities*. The interviews began with a question focusing on how a typical day proceeded starting from waking up at home and leaving home for work. The next topic of the interview concerned what a key stakeholder first did when s/he arrived to the workplace and what s/he did during her/his workday. The interviewees were also asked to select from the campus the most pleasant room or other space and the most unpleasant space and to describe what in these spaces made them like or dislike them. The informants were continuously asked to reason their choices through the question “Why?”. In the end, the interviewees were guided to the test case classroom K113, and when they entered the classroom, they were asked to describe what they saw and how they felt towards the space, in what ways they as a teacher/student/FM/maintenance acted in the classroom, what they did, how and why. Finally, two picture series - design characteristics and material characteristics with four to five sets of pictures - were shown to the interviewees and they were asked to reflect on the pictures, to select and argue for some that they found inspiring, pleasing and making them feel good and some that made them feel the opposite such as anxious or bored.

2.2. Participatory workshops

Participatory workshops were run by a service designer. The aim of the workshops was to map out the characteristics of well-functioning and ideal working and teaching/learning environment, i.e. what kinds of features of both the physical and digital environment supported the participants’ work. Furthermore, the workshop looked at current and pipeline classroom technologies with the view of understanding the guidelines, experiences, and e.g. frequently occurring problems.

2.3. User journeys: Simulations of an experience of first-time visit to the campus

The visiting sustainability expert and interior architect organised the simulation of the experiences of a new student arriving to the campus and how s/he finds her/his way to the spaces. The simulation of an experience consisted of a walk starting outside the campus and leading inside. During the walk, the participants noticed and discussed about the need to update the information board, the lack of guides how to find one’s way inside the building and other drawbacks. The methodology is described in more detail in a book in print by the interior architect [10].

2.4. Analyses

The first step of the analysis started from identifying from research literature KPIs of sustainable learning environment creation [1, 2, 6, 11] and then these were tested against Sustainable Education Design Criteria [2]. The first two authors carried out intensive co-creative research sessions where they compared their separate individual understanding regarding how they interpreted the possible alternative KPIs that could be formed from the data. After this they reflected the preliminary suggestions to the SED tool and started discussing how the alternative KPIs corresponded to the dimensions present in the SED carousel. Then they proceeded to drawing a comparison table that depicts the proposed alternative KPIs in the form of questions that eventually became the foundation for the alternative KPIs. Then the questions were tested against the participatory service design process and outcomes of the process. These were then crystallised as credits (e.g. innovation intensity or future-readiness), that were in turn coupled with corresponding SDGs. The coupling and assignment of points on a 1–5 scale (addressing how well the alternative KPI had been covered or successful in the process) was done in intensive iterative researcher meetings. The analysis process resulted in a combinatory table that is presented as Table 2.

The previous work described in [2] laid out a ninefold-table with sustainability dimensions. These are presented in Table 1 below. In the analysis process, three key themes were identified as essential for the participatory process and how it could contribute to sustainable solutions on campus. The themes were reflected upon key performance indicator (KPI) literature [10] and the SED manual [2]. In the manual, the 9-fold table (Table 1 below) takes into account the economic, environmental and social aspects of sustainability, which in turn are opened up in three layers divided into three questions.

The dimensions, leading to the proposed alternative KPIs, were: co-design & participation; socio-cultural performance; and values and post-occupancy evaluation (POE) and related guidelines for planning and assessment.

Table 1. Modified sustainability dimensions in holistic design of sustainable education.

	ECONOMIC	ENVIRONMENTAL	SOCIAL
Cultural	vitality The solution connects to the surrounding area and brings vitality to the area as a natural part of it	recycling The solution is ecological and sustainable on many levels	identifiable The identity of the solution fits its surroundings and culture and represents as a continuum the vision of the activities and supports the goals set for its use
Digital	resource wisdom The practices and physical and digital choices of the solution are based on local sourcing and sharing	easy to use The solution is intelligent and intuitively usable	connectivity The solution is connected and it connects physically, digitally and socially
Physical	multiplicity in use The solution responds to different needs of various users and enables different uses	self-sustained The solution is self-sustained and produces energy	communality The solution supports communal practices by its physical and digital affordances

3. Findings

The results highlight the involvement of all stakeholder groups in order to source for user perspectives and agency in learning landscape retrofitting. The original nine-fold table (Table 1) was merged with the themes identified in the present study in terms of participatory design and co-design. The merger resulted in a new set of key topics (credits in Table 2) corresponding to the original topics, and aligned with the dimensions of environmental, economic and social sustainability. These questions form the backbone for alternative KPIs that are further developed using subsets of assessment questions that can be assigned points. In addition, the alternative KPIs and credits were mirrored against the Sustainable Development Goals (SDGs) to see how the SDGs can be operationalised in participatory service design processes. The preliminary alternative KPIs presented in Table 2 below need not be in the past tense.

When formulated in the present, they can work as guidelines and a sounding board for the planned process.

Table 2. Alternative KPIs, credit and related SDGs as well as a tentative evaluation of the pilot campus environment.

Alternative KPI	Label	Credit	Related SDG	Points*
How were the SDGs considered or visible during the process?	A	sustainability goals and values	3 – Good health and well-being	2,5
What and how was learnt during the process?	B	learnings and assessment	4 – Quality education	5
How were the stakeholders heard and involved in the process?	C	stakeholder perspectives and participation	8 – Decent work and economic growth	4
What kinds of services and/or infrastructure were produced during the process?	D	services and infrastructure	9 – Industry, innovation and infrastructure	2
How did the process reduce inequalities and promote equality in participation and contribution?	E	equality and contribution	10 – Reduced inequalities	5
How did the process & product support local innovation and sustainable community development?	F	innovation intensity	11 – Sustainable cities and communities	4
How was future-readiness part of the process and product?	G	future-readiness	12 – Responsible consumption and production	2,5
How did the process promote justice and resilience?	H	resilience and justice	16 – Peace, justice and strong institutions	4
How did the process promote open communications, networking and connectedness?	J	sharing and partnerships	17 – Partnerships for the goals	5

*Scale of the points assigned: 1 = No evidence, 2 = Some evidence, 3 = Moderate evidence, 4 = Strong evidence 5 = Very strong evidence

For instance, for alternative KPI **D** (services and infrastructure), there might be tentative new services provided by the transformed outcome, yet they might not be accessible or ready. This yields to less points for alternative KPI **D**. The assignment of points for the test case was done by two researchers that were involved during the whole process and studied and observed the actions and co-design procedures.

Assigning points

A	2,5
---	-----

The interior architect did implement sustainability criteria in the material selection and process, but she did it secondarily, and the issues were not discussed as part of the process as such.

B	5
---	---

The campus architects repeatedly stated that they found it very useful and important to contribute and participate in the process also from a user perspective, and they felt they learnt new skills for future use.

C	4
---	---

Most stakeholder groups were involved in the beginning phases of the process, and their input was integrated in the master plan, however, they were not consulted between participatory processes and ready layouts.

D	2
---	---

The process produced e.g. the idea and eventually implementation of a new HUB, Campus Learning and Development Initiatives HUB (Caledonia). The management process was however not transparent nor consistent, and the process stopped when it was supposed to be implemented.

E	5
---	---

Gender distribution was even, and the participants thanked the team for having having invited them and felt they could really contribute.

F	4
---	---

The new HUB was started and completely new networks were created thanks to the process. Also, people started reaching out after the participatory process, making the outcome broader than the mere pilot, and the FM of the university are looking forward to the retrofitted testbed in order to learn from the case study and be able to scale the outcomes up in other currently ongoing vast construction and retrofitting processes.

G	2,5
---	-----

The master plan is future-ready and flexible in furniture and other solutions, but the process has for external reasons come to a halt, and the outcome cannot be assessed yet.

H	4
---	---

The process produced several documents that are being communicated to the university management, and there will be a new process that is intended to be applied in future campus development and retrofitting projects.

J	5
---	---

There are several new developments that are directly or indirectly related to the campus change process described here, including “Supervision Corner”, a novel type of a meeting point for student services and students.

An overview of the trialled alternative KPI tool and points yielded was decided to be visualised as a spider diagram. The diagram shows the points assigned on a scale 1 - 5 for each alternative KPI. The spider is presented in Figure 2

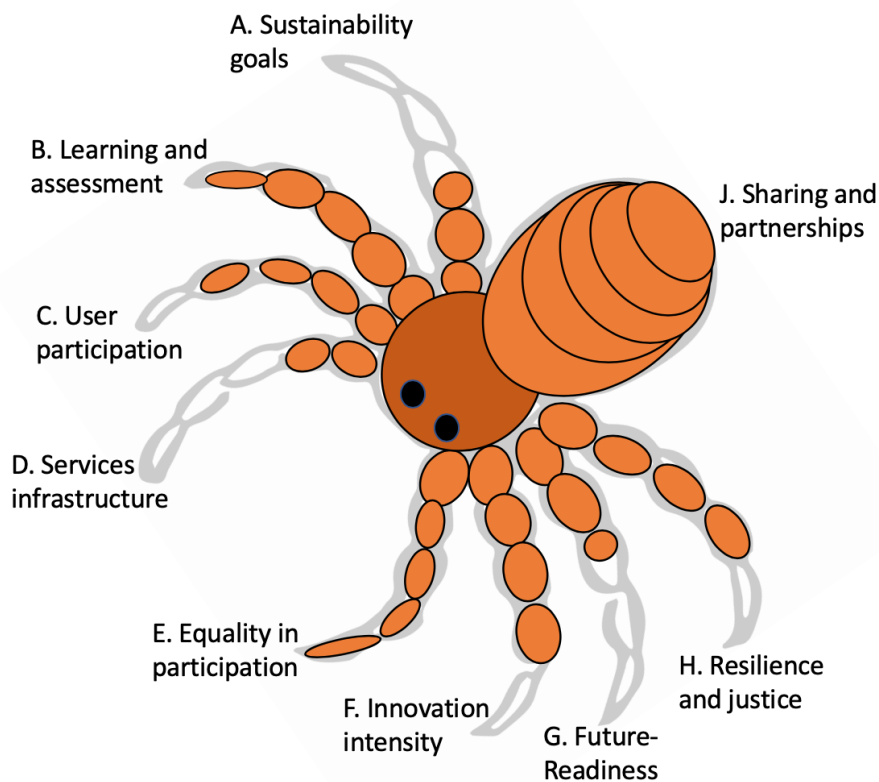


Figure 2. Spider diagram illustration of the assessment of the test case.

4. Discussion

One of the tenets of the current approach was to build alternative KPIs. One dimension to the work is, how the sustainability evaluations and related/relevant user experiences and perspectives can be extracted from participatory design, and be used for alternative KPIs, in addition to existing ones [11; 12; 13] that inform design and retrofitting processes. The present work looked at co-design and participatory service design as means to design sustainable learning landscapes. We hold that participation is the key to success in reaching the SDGs. Without participation, there is no contribution, and without contribution, no change. This surely works in contexts other than learning landscapes, as well [8].

The approach had to do with existing spaces and facilities that are retrofitted, and the measures that the participatory process aimed to develop do not include e.g. site selection, initial cost or indoor air quality, otherwise important aspects to be kept in mind while constructing sustainable, healthy buildings [8].

New kinds of co-design processes and alternative KPIs can contribute to learning about the SDGs, making people more aware of their importance for life on land and in water. The alternative KPIs can also inform management during change processes, thus giving necessary feedback and the possibility to redirect the process. In terms of the SDG number 17 (Partnerships for the goals), for instance, it was found that intensive, multiprofessional participatory processes can produce mutual understanding of different professional approaches, and it can lay the foundations for a common language and a common ground to be able to apply different dimensions of sustainability, as well.

Education plays a crucial role in attaining sustainable development goals, in fostering individuals and vital communities with change agency and a vision for a better tomorrow. The tool in progress that is presented in this paper works in informing the management before, during and after a learning landscape change process. The dimensions and the related SDGs can be considered well before the initiation of transformative organisational processes, so as to pave the path towards a better implementation of sustainable solutions in the outcome.

These proposed alternative KPIs can be used as indicators for sustainability, innovation and learning during participatory change processes and in evaluating the outcome. They can increase understanding regarding the impact that the physical-digital environment has on learning and well-being. The alternative KPIs can inform learning landscape - and other - change processes preemptively when they are being planned, as a provisional tool for sustainability implementation through co-design and community involvement [14]. The scope of the present test case was one campus and specifically, one change process of one test bed. Thus, the assigned points as to the alternative KPIs and their credits are naturally indicative and not claimed to have been covered exhaustively.

In the process, the users learn to become more aware of their spaces and surroundings (physical and social), and to be active agents in transforming them and adjusting them to suit their needs and purposes. This is central sustainable development - agency and a sense of contribution - and agile spaces make the transformation possible on many levels (well-being, sustainability, attractiveness, suitability to needs etc.) [10; 15]. It would be beneficial also for sustainability that learning landscapes be designed in a participatory fashion. Only through participation, the learning landscapes can be custom made to meet user requirements.

The results show how the built environment can be seen as a platform in producing both sustainability and learning about sustainability through awareness. In this work, participatory service design can be an effective approach. We portray the healthy learning landscapes for social/cultural sustainability through co-design. Validating the alternative KPIs and through them, assessment methods for sustainability, remain key also in future studies building on our present findings. Co-design is a laborious and demanding process, and we need to develop tools that make the process less work-intensive and more accessible for different organisations.

The overall outcome was a new kind of operationalisation of the SDGs in the context of a campus learning landscape change process. The related SDGs cover what could be called the social/cultural dimension of sustainability. For instance, we claim that well-being [10] can be produced through participation, and participation produces a sense of agency and belonging [16]. These basic needs - see e.g. [17] - are quintessential for human prosperity and in leading a meaningful life. In the future, we will develop assessment criteria based on the credits presented for the alternative KPIs, and these criteria will be tested in more cases and different contexts globally to validate the framework further.

Acknowledgements

This study was partially supported by the Faculty of Educational Sciences, University of Helsinki, by a grant to development work regarding digital solutions and spatial retrofitting.

We would like to extend our thanks to all the participants for their valuable input during the test process and co-design. Campus architects Pirjo Ranta and Ari Nisonen are appreciated for their professional participation and expert discussions. Our team members, interior architect and sustainability expert Elina Grigoriou and service designer Jaana Tarma, are warmly thanked for an immensely valuable input, without which the foundations for this research paper would not exist.

References

- [1] Dugdale S 2009 Space Strategies for the New Learning Landscape Educause Review March/April 51-63
- [2] Sandström N and Nenonen S 2018 Sustainable Education Design - A Manual. (Tampere: Tampere University of Technology. Laboratory of Civil Engineering. Report 24)
- [3] Ott K 2003 The Case for Strong Sustainability. In: Ott, K. & P. Thapa (eds.) Greifswald's Environmental Ethics. Steinbecker Verlag
- [4] Pelenc J Ballet J and Dedeurwaerdere T 2015 Weak Sustainability versus Strong Sustainability. Available at: <https://sustainabledevelopment.un.org/content/documents/6569122-Pelenc-Weak%20Sustainability%20versus%20Strong%20Sustainability.pdf>, accessed on 13th April, 2019
- [5] Elf M Fröst P Lindahl G and Wijk H 2015 Shared decision making in designing new healthcare environments—time to begin improving quality BMC Health Services Research 15 114 1–4
- [6] Nenonen S, Niemi O and Agrawal R 2019 Co-creation of the future sustainable learning environment. A paper to be presented in this conference SBE19 Helsinki - Sustainable Built Environment Conference at Helsinki May 22nd - 24th 2019
- [7] Vals A E J and P B Corcoran 2006 Sustainability as an Outcome of Transformative Learning. In J Holmberg and B E Samuelsson (ed.) Drivers and Barriers for Implementing Sustainable Development in Higher Education. Göteborg Workshop December 7-9, 2005. U N E S C O: Education for Sustainable Development in Action Technical Paper N°3, September 2006 103–108
- [8] Gelfand L 2010 Sustainable School Architecture (New Jersey: John Wiley & Sons)
- [9] Axelsson R Angelstam P Degerman E Teitelbaum S Andersson K Elbakidze M Drotz M K 2013 Social and Cultural Sustainability: Criteria, Indicators, Verifier Variables for Measurement and Maps for Visualization to Support Planning AMBIO 42 215–228
- [10] Grigoriou E 2019 [in print, to be published in May 2019] Wellbeing in Interiors: Philosophy, design and value in practice (London: RIBA Publishers)
- [11] Chan A B C and Chan A P L 2004 Key performance indicators for measuring construction success Benchmarking: An International Journal 11 No2 203-221
- [12] Brown M Cevetello J Dugdale S Finkelstein A Holetto R Long P Meyers C 2017 Learning Space Rating System Version 2 EDUCAUSE Learning Initiative Available at: https://www.educause.edu/~mediParmenter/D_a/files/educause/eli/initiatives/lrsrv2.pdf?la=en

- [13] Parmenter D 2015 *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs* (New Jersey: John Wiley & Sons)
- [14] Murphy K 2012 The social pillar of sustainable development: A literature review and framework for policy analysis. *Sustainability: Science, Practice, & Policy* 8 15–29
- [15] Læssøe J 2008 Participation and Sustainable Development: The Role and Challenges of Mediating Agents. In: Reid A Jensen B B Nikel J and Simovska V (eds) *Participation and Learning*. (Dordrecht: Springer)
- [16] Sandström N and Nevgi A 2019 From needs to deeds: Where is pedagogy in a university campus change process. Manuscript submitted to be published
- [17] Maslow A H 1970 *Motivation and Personality* (New York, NY: Harper & Row)