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Planning competencies and transformative pedagogy for sustainable development

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ABSTRACT

Understood as "a means by which society decides collectively what urban [and rural] change should be like and tries to achieve that vision by a mix of means.", there is broad consensus that planning should fully incorporate the notion of sustainable development. Planners have a critical role in envisioning and driving local transitions to sustainable development. This requires transforming what planners learn and how they learn in higher education. This study is the first to identify a set of planning competencies for sustainable development. It proposes in three areas planning competencies for sustainable development, including (a) knowledge to understand human settlements, (b) skills to plan sustainable settlements, and (c) values to stand for sustainable communities. Following a conceptual analysis of transformative pedagogy as a superior theoretical approach to teaching for sustainable development, this study is also the first to identify types of transformative learning activities, including (1) unlearning- relearning activities, (2) learning through new experiences, and (3) ill-structured problem solving. The study therefore makes original contributions to both planning and education literature, in addition to its interdisciplinary methodological contribution through an original design of 'framing and

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sensemaking + reframing' applied for knowledge recombination between two fields – i.e., sustainability competencies, and planning competencies. The study presents case examples submitted by planning schools around the world to demonstrate transformative learning activities that enhance planning competencies for sustainable and resilient urban development.

1. Introduction

Urban development and the interdisciplinary fields shaping the next generation of planners and urbanists play a vital role in transition toward a more sustainable society (Bina et al., 2016). Focused on balancing environmental protection, economic development and social equity in human settlements (Campbell, 1996), the mission of planning is sustainable development. Sustainable development, which was initially introduced in the Brundtland Report (WCED, 1987) and further emphasized by Agenda 21 (UN, 1992), has been a foundational aspect of the planning education and profession since 1995 when ingrained in 'Core Requirements for a High Quality European Planning Education' (AESOP, 1995). The focus of planning roles further shifted from managing environmental change to actively pursuing visions of sustainable development (Davoudi & Pendlebury, 2010). Ziafati Bafarasat et al. (2023) note that most of the United Nation's Sustainable Development Goals (SDGs) could be observed in planning objectives for human settlements, from SDG 11, which seeks to "Make cities and human settlements inclusive, safe, resilient, and sustainable." (UN, 2015) to the other SDGs, such as reducing inequalities, tackling climate change, and promoting health and economic growth.

Following Rydin (2011), we argue that the goal of planning is to envision and drive the sustainable development of human settlements, and we regard planning as "a means by which society decides collectively what urban [and rural] change should be like and tries to achieve that vision by a mix of means." (Rydin, 2011, 12). We advocate the same approach of "clouded clarity" (Seeley, 1962) to the concept of planning - something clear enough to make certain vital distinctions, but not so clear to tie the definition to certain contexts.

Meanwhile, the tasks of planners and skills that they need are complex and context sensitive. Othengrafen and Levin-Keitel (2019) identify six types of planners: the local-specific analysts, the experienced generalists, the reactive pragmatists, the project-oriented planners, the compensatory moderators, and the innovative designers. Many planners, like the reactive pragmatists in Othengrafen and Levin-Keitel's (2019) typology, might work in imperfect planning and development contexts and spend much of their time fighting small but lengthy battles that have only marginal significance on the big picture of urban change. This is not only limited to regulatory planning systems or less developed nations. For example, in a study titled *'What planners don't do is plan'*, Phelps and Valler (2024) argue that the skill of envisioning sustainable futures is rarely needed by planners in the contemporary institutional context and professional landscape of English planning. One might ask how strongly planners should ultimately (learn to) advocate positions that - especially today - are in blatant contradiction to large sections of society, such as climate change, and how they could be convincing at all

However, Phelps and Valler (2024) rightly argue that we should look and prepare beyond the institutional needs of the immediate present to enable sustainable transitions. Albrechts et al. (2020) note that by aiming for sustainable development, planning is transformative, seeking not only to transition human settlements but also change mindsets and institutions through communication and other skills. As Healey (1999) argues from an institutionalist perspective, planners could play a role in reshaping the context in which they are operating. While some knowledge, skills and values for planning for sustainable development might seem less relevant to planners as reactive pragmatists, they could help these professionals reshape their roles or do their tasks in alternative ways to support sustainable transitions. This requires transforming what planners learn and how they learn in higher education empowering them as change agents.

This study asks: What competencies should planners gain to successfully contribute to sustainable development? Competencies are defined as an integrated set of knowledge, skills and attitudes to successfully perform tasks in authentic environments (De Kraker et al., 2007). The study also aims to explore how planning education could nurture planning competencies for sustainable development. The study addresses the ongoing conversation about how to transition planning systems within a context of climate action and spatial inequalities, and how to teach planning for sustainable development (Caves & Wagner, 2018; Edwards & Bates, 2011; Taylor & Close, 2022).

This study is the first to propose a set of planning competencies for sustainable development, also the first to identify types of transformative learning activities as transformative pedagogy is advocated as a suitable theoretical approach to teaching for sustainable development. The study therefore makes original contributions to both planning and education literature, in addition to its interdisciplinary methodological contribution through an original design of 'framing and sensemaking + reframing' applied for knowledge recombination between two fields - i.e., sustainability competencies and planning competencies (illustrated in Section 2, methodology).

The paper is structured as follows: Section 2 explains the research process and systematic methodology of interdisciplinary knowledge recombination designed to establish planning competencies for sustainable development. Section 3 answers the first question of the study, proposing through knowledge recombination six planning competencies for sustainable development. Section 4 answers the second question of the study, starting with an analysis of transformative pedagogy as a superior theoretical approach to teaching for sustainable development, and then identifying three types of transformative learning activities and illustrating them with original teaching examples fostering planning competencies for sustainable development. Section 5 provides the conclusions of this study.

2. Research process and methodology

The study involved conceptual and pedagogical questions for which tailored methodological ensembles were designed and applied in integration. The first question (planning competencies for sustainable development) required analysis of scholarly resources, but there were no studies in English providing answers to this question. Available studies were in the following distinct fields: competencies for sustainable development, and competencies for planning. This study needed to undertake knowledge re-combination between the two fields to identify planning competencies for sustainable development. Informed by the relationship between sustainable development and planning, a process of (a) framing and (b) sensemaking + reframing was designed, with sustainability competencies initially framing planning competencies, and then planning competencies making sense of this borrowed frame and reframing it to result in planning competencies for sustainable development. This is explained in detail below.

Studies about competencies for sustainable development were first reviewed and analyzed, resulting in a conclusion that Wiek et al.'s (2011) widely acknowledged synthesis of five key competencies is most relevant and inclusive of other studies. In the next step, the literature about planning competencies was reviewed. The search, identification, screening, and inclusion of records about planning competencies was undertaken according to the JBI scoping review methodology (Aromataris et al., 2024) and PRISMA-ScR checklist (see Tricco et al.,

2018) as reported in Fig. 1. As Fig. 1 indicates, this study identified 77 records from Web of Science and 223 from Google Scholar based on the principle of search saturation defined by Ziafati Bafarasat and Sharifi (2024). In other words, records in these search platforms were sorted by relevance, and all records from the first until three consecutive records with less relevant titles were identified for this review. Despite the systematic approach adopted, the literature search, identification, and screening involved some biases difficult to avoid in such studies, such as limiting the search to English, identifying more accessible records by relying on relevance sorting by search engines, and screening studies that are not peer-reviewed to ensure integrity (see d, Fig. 1).

In the next step, the included records were comparatively analyzed to identify planning competencies. A detailed list of planning competencies was identified. The next step was to integrate the five broad sustainability competencies with planning competencies through (a) framing and (b) sensemaking + reframing to result in planning competencies for sustainable development. This process was undertaken as follows. An evidence synthesis table of four columns was developed in Microsoft Word. In the table, the first column provided abstract descriptions of planning competencies, the second column provided labels of planning competencies, such as 'negotiation skills' and 'spatial data analysis, the third column consolidated labels of planning competencies, and the fourth column assigned the consolidated competencies to the five broad competencies for sustainable development or to 'other' where this assignment was not possible. When this framing stage was complete, the analysis was repeated, this time to undertake the sense-making and reframing stage. In other words, descriptions of planning competencies in the first column of the table were synthesized in terms of their roles in supporting sustainable development. This resulted in classification of these descriptions into: (a) knowledge to understand human settlements, (b) skills to plan sustainable settlements, and (c) values to stand for sustainable communities. With this inductive outlook of planning competencies for sustainable development, the last column of the table was reviewed, resulting in refinements. In other words, anticipatory competence was retitled envisioning competence. The definition of this competence and those of the other sustainability competencies were reworked using the inductive outlook situating them in planning competencies. Also, the 'other' category in the fourth column was replaced by a new category defined as 'spatial competence', hence resulting in six planning competencies for sustainable development.

The lead author undertook the conceptual part of the study, and then proceeded to the second, pedagogical question: How to teach planning competencies for sustainable development. In so doing, he undertook an analysis of the literature on education concluding that transformative pedagogy is a suitable theoretical approach to teaching for sustainable development. In the absence of studies in education literature about types of learning activities in transformative pedagogy, a conceptual synthesis was undertaken of the education literature to identify types of transformative learning activities. To illustrate the types of transformative learning activities, original teaching practice examples were solicited by the lead author, inviting the contributing authors, who are mostly senior academics with practical experience, to report on their transformative fostering of planning competencies for sustainable development. The teaching practice examples serve illustrative purposes; they are not intended as empirical investigations about the conceptual contributions of the study. Although majority of the teaching practices included have been nominated or prized for pedagogic excellence at the institutional, national or international levels, they are not intended to demonstrate best practice.

3. Planning competencies for sustainable development

This section presents the results of knowledge recombination between sustainability competencies and planning competencies using the methodological design of 'framing and sensemaking + reframing' explained in the previous section. After Section 3.1 establishes sustainability competencies, Section 3.2. provides an original conceptual contribution of this study in terms of planning competencies for sustainable development.

3.1. Sustainability competencies

As De Kraker et al. (2007) note, the term 'competencies (or: competences) for sustainable development' is still not common. However, research on key competencies for sustainable development has been on the rise to identify essential skills and abilities needed to address the complex and multifaceted sustainability challenges. Achieving sustainable development involves tackling significant issues, often referred to as "wicked problems," which are characterized by their complexity and interdependence (Wiek et al., 2011). These challenges, which span multiple timescales, levels, and geographic areas, are rising, hence requiring interdisciplinary knowledge and skills for visionary, collaborative, and systematic solutions that work (Lambrechts & Van Petegem, 2016). They also require enhancing normative abilities, including supporting body's capacity for being affected (Marotta & Cummings, 2019) and extending life orientation and moral circle from 'I / my family' to 'planet Earth' (Salonen & Siirilä, 2019) to take a stance for the environment and justice, be active citizens and professionals, and reconcile values around sustainable development (Grice & Franck, 2017).

Several scholars have defined sustainability competencies encompassing the knowledge, skills, values and attitudes needed to effectively address the societal and moral complications inherent in sustainability challenges. According to Tilbury and Wortman (2004), key competencies for sustainable development include systems thinking, which involves understanding the interconnectedness and complexity of sustainability; envisioning, which is the ability to imagine a more sustainable future; partnership building, which focuses on fostering inclusive participation in decision-making processes; and critical thinking, which entails questioning and challenging the status quo. De Haan (2006) identifies the competencies for sustainable development as foresighted thinking, interdisciplinary collaboration, a cosmopolitan perspective, transcultural understanding, and cooperation. Additionally, the importance of participatory learning, planning and implementation skills, the capacity for empathy, compassion, and solidarity, self-motivation, the ability to inspire others, and the ability to critically reflect on individual and cultural models is emphasized (De Haan, 2006). Sleurs (2008) states that values and ethics, emotions, systems thinking, knowledge, and action can be considered key competencies for sustainable development. Svanström et al. (2008) argue that competencies for sustainable development include systems or holistic thinking, integration of various perspectives, critical thinking, understanding diverse values and attitudes, change agent abilities, and communication skills.

Roorda (2010) outlines the competencies for sustainable development as responsibility, emotional intelligence, systems thinking, future orientation, personal involvement, and action skills. Mochizuki and Fadeeva (2010) identify knowledge, systems thinking, emotions, ethics and values, and actions as the competencies for sustainable development. Willard et al. (2010) conducted a comprehensive survey targeting sustainability professionals, primarily from North America (80 %), to identify the key competencies required for effective sustainability practice. Their findings highlight essential competencies for sustainable development, including the ability to communicate effectively with stakeholders, strong problem-solving skills, and the capacity to inspire and motivate others. Additionally, they emphasize the importance of strategic planning, systems thinking, skills in collaboration, facilitation, and driving organizational and external change.

According to Frisk and Frisk & Larson (2011a, 2011b), core competencies for sustainable development include systems thinking, anticipatory thinking, the ability to build interpersonal relationships and collaborate, and strategic action. In a synthetic review of previous studies, Wiek et al. (2011) concluded that, although using different methods to define and cluster competencies for sustainable

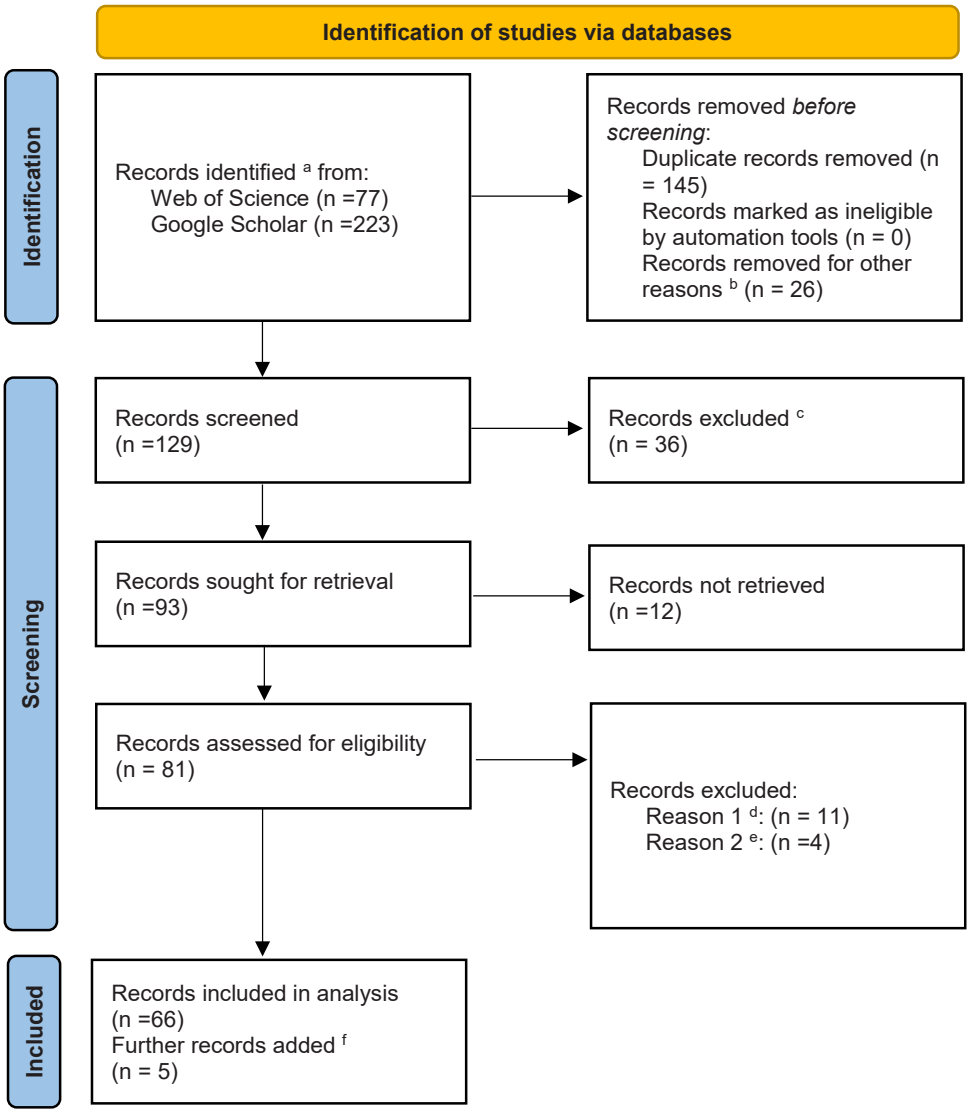


Fig. 1. PRISMA 2020 flow diagram of scoping studies for inclusion in the evidence extraction and processing table (Authors, template from: PRISMA,[2] 2024). [a] Search string applied: urban plan* OR city plan* OR town plan* OR spatial plan* OR land use plan* OR rural plan* AND competency OR competence OR competencies OR (skill AND knowledge). [b] Only abstract available in English. [c] Excluded through abstract screening for relevance and similarity. [d] Studies not peer reviewed (e.g., preprints). [e] Chapters reproduced from included papers. [f] Reports from professional bodies of planning: RTPI, 2019; AICP, 2017; PIA, 2020; ECTP-CEU, 2017; AESOP, 2024..

[2] https://www.prisma-statement.org/prisma-2020-flow-diagram

development, all of those studies cover comparable elements. The researchers therefore suggest five key competencies for sustainable development to integrate the findings of previous studies. These include: systems thinking, anticipatory competence, normative competence, strategic competence, and interpersonal competence (Wiek et al., 2011). Subsequent efforts have applied this highly cited framework to detail, examine and apply or supplement competencies for sustainable development (Lambrechts & Van Petegem, 2016). Table 1 provides definitions of the five key competencies and indicates various other studies recognizing each as a competence for sustainable development.

Some studies provide lists of competencies that involve abstract concepts (e.g., justice), items that almost refer to the same abilities, or common practices (e.g., assessment and evaluation), but the core of their lists reflects Wiek et al.'s (2011) competencies framework. For example, Rieckmann (2012) outlines competencies for sustainable development, including systems thinking, interdisciplinary collaboration, anticipatory thinking, justice, responsibility and ethics, critical thinking and analysis, empathy and perspective-taking, effective communication and media usage, strategic action, assessment and evaluation, and tolerance for ambiguity and uncertainty. Two similar studies followed in the subsequent years. First, Lambrechts et al. (2013) identify the following competencies for sustainable development: systems thinking, interdisciplinary collaboration, anticipatory thinking, justice, responsibility and ethics, empathy, perspective-taking, strategic action, and personal involvement. Then, Lans et al. (2014) highlight the following competencies for sustainable development: systems thinking, anticipatory thinking, justice, responsibility and ethics, interpersonal relations and collaboration, empathy and perspective-taking, and strategic action.

MacDonald and Shriberg (2015) emphasize the importance of practice-oriented skills, highlighting negotiation, coalition building, and

Table 1
Wiek et al.'s (2011) five key competencies for sustainable development recognized widely by other studies (Authors).

Competence	Definition	Other studies recognizing the competence
Systems-thinking	"The ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem-solving frameworks." (Wiek et al., 2011, 207)	Tilbury and Wortman (2004); Svanström et al. (2008); Sleurs (2008); Roorda (2010); Frisk & Larson (2011a, 2011b); UNESCO (2017); Günther et al. (2024); Mochizuki and Fadeeva (2010); Willard et al. (2010); Rieckmann (2012); Lambrechts et al. (2013); Lans et al. (2014); Evans (2019); Redman and Wiek (2021); Brundiers et al. (2021); Lozano, Merrill, Sammalisto, Ceulemans, Lozano (2017); Lambrechts & Van Petegem, 2016
Anticipatory competence	"The ability to collectively analyze, evaluate, and craft rich "pictures" of the future related to sustainability issues and sustainability problem-solving frameworks." (Wiek et al., 2011, 207–209)	Frisk & Larson (2011a, 2011b); Rieckmann (2012); Lambrechts et al. (2013); Lans et al. (2014); UNESCO (2017); Günther et al. (2024); Lozano, Merrill, Sammalisto, Ceulemans, Lozano (2017); Lambrechts & Van Petegem, 2016
Normative competence	"The ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets." (Wiek	UNESCO (2017); Günther et al. (2024), Evans (2019); Lambrechts & Van Petegem, 2016

(*continued on next page*)

Table 1 (*continued*)

Competence	Definition	Other studies recognizing the competence
	et al., 2011, 209)	
Strategic competence	"The ability to collectively design and implement interventions, transitions, and transformative governance strategies towards sustainability." (Wiek et al., 2011, 210)	Evans (2019); Redman and Wiek (2021); Brundiers et al. (2021); Willard et al. (2010); UNESCO (2017); Venn et al. (2022); Günther et al. (2024); Lambrechts & Van Petegem, 2016
Interpersonal competence	"The ability to motivate, enable, and facilitate collaborative and participatory sustainability research and problem solving." (Wiek et al., 2011, 211)	Rieckmann (2012); Frisk & Larson (2011a, 2011b); Redman and Wiek (2021); Evans (2019); Brundiers et al. (2021); Venn et al. (2022); Lambrechts & Van Petegem, 2016

facilitation as key competencies. UNESCO (2017) confirms the importance of systems thinking, anticipatory thinking, partnership building, and critical thinking, while also emphasizing several other competencies for sustainable development. These include normative competence, which involves understanding societal norms and values; strategic thinking, focused on developing innovative actions; self-awareness, encouraging individuals to reflect on their roles within their local communities; and integrated problem-solving, aimed at applying and proposing practical, effective solutions. These competencies and subsequent studies largely reflect Wiek et al.'s (2011) framework, with 21 additional competencies identified, such as foresighted thinking, mostly falling under that framework as illustrated in Table 2. For example, Evans (2019) identifies the following key competencies for sustainable development: creative and strategic competence, interpersonal and communication skills, systems thinking, transdisciplinary competence, and critical and normative competence. Redman and Wiek (2021) outline the following competencies for sustainable development: systems thinking, futures thinking, values thinking, strategic thinking, implementation, interpersonal and intrapersonal competencies, and integration competence. Brundiers et al. (2021) identify systems thinking, values thinking, futures thinking, strategic thinking, interpersonal skills, integrated problem-solving, and implementation competencies for sustainable development. Venn et al. (2022) present six competencies for sustainable development: interpersonal collaboration, capacity building, intrapreneurial, strategic, political, and implementation competencies. Günther et al. (2024) confirm the competencies for sustainable development outlined in the UNESCO framework, which include systems thinking, integrated problem-solving, anticipatory thinking, normative competence, strategic competence, collaboration, critical thinking, and self-awareness. Additionally, they introduce two new competencies: the ability to deal with knowledge and information, and the competency to participate, particularly in political and democratic processes (Günther et al.,2024). Overall, it can be concluded that the model proposed by Wiek et al. (2011) remains the most comprehensive set of competencies for sustainable development. Wilhelm et al. (2019) consider this model as the reference framework for tertiary education in sustainable development. Evans (2019) emphasizes that much of the recent work on sustainability competencies builds upon the contributions of Wiek and colleagues, with their model serving as the reference framework for understanding and developing sustainability competencies.

3.2. Planning competencies for sustainable development

Against calls for embedding sustainability competencies into degree programs (Lambrechts et al., 2013), there is a concern in some disciplines that this might lead to reductions in the amount of core subject matter being taught (Jones et al., 2008), but this is not the case with planning which shares much of its interdisciplinary competencies with sustainable development, albeit with a particular place dimension in planning. Evans & Rydin (2013, 56) observe that "professional planners - urban, town or land use planners… have tended to define themselves as holding more general skills, expertise and competences". As Edwards and Bates (2011) argue, the essence of planning competencies is less about mastering specific subject areas and more about the ability to think strategically about the future, make informed decisions, and collaborate effectively to address complex problems for sustainable development. Various studies have reviewed the competencies needed for planners with most attention in academic research given to generic knowledge and skills (Rogerson et al., 2010). Alexander (2001), for example, suggests that phronetic knowledge - encompassing good sense and sound judgment - is highly valued. Reeves (2009) notes that working effectively with the community, interacting with other professionals, building the evidence base to plan ahead, and designing creative solutions are key for success as a planner. Some believe that planning competencies should further integrate with sustainability competencies. For example, Rooij and Frank (2016) argue that the evolving urban environment and societal and political changes necessitate a review of planning competencies for sustainable development. Schmitt and Magnusson (2024) highlight competencies of planners to support radical urban change towards sustainability, focusing on collaboration, community building, normative and ethical abilities, and understanding complex structures. De Blust et al. (2022) highlight the need for actor-institutional knowledge and analysis, understandings of coalition building, power structures and relations, ethics and positioning, and socio-environmental justice. Through integrating sustainability competencies discussed earlier with planning competencies, the following subsection identifies and discusses planning competencies for sustainable development in three areas, including (a) knowledge to understand human settlements, (b) skills to plan sustainable settlements, and (c) values to stand for sustainable communities.

3.2.1. Knowledge to understand human settlements

Knowledge to understand human settlements in depth and breadth comprises spatial competence and systems thinking as follows.

3.2.1.1. Spatial competence. Knowledge of human settlements is the most basic and recognized requirement of the planning profession, but the scope and depth of this requirement is increasing at an unprecedented rate as human settlements are rapidly evolving and many disciplines are generating new knowledge, methods and theories enabling deeper analysis and richer representation of human settlements from different aspects. There are calls for planners' knowledge of human settlements to progress from the levels of awareness and understanding to the analytical level suitable for application (De Blust et al., 2022). However, Lombard (2014) notes that such knowledge is not always observed in planning practice, as, for example, experienced in planners' approach to informal settlements. Healey and Underwood (1978) argue that with many planners employed in statutory bodies with a responsibility for regulating development, knowledge about planning legislation and local policy is often underestimated. Friedmann (1996) identified shortcomings in planning education in fostering the ability to deeply understand urban habitats and analyze human settlements from various aspects. While some highlight the need to enhance survey and data-processing skills of planners (Megahed et al., 2019), others believe that planning education should include more social and administrative science courses to enable informed analysis of human settlements (Edwards & Bates, 2011). There are growing calls for nurturing knowledge about planning theory, politics, history, culture, economy, institutions and regulations to integrate with learning about survey methods, enabling students to immerse themselves in place to produce rich evidence and undertake reflective analyses of such evidence (e.g., what culture does and why) (Howe & Langdon, 2002; Abram, 2016; Yonder et al., 2021; Kallus, 2021). While planners should be able to understand human settlements from different aspects, they also need to deepen this understanding in an area of interest (Sanchez & Afzalan, 2017), such as health and place or urban design, hence gaining the ability to provide particular solutions to complex challenges of human settlements informed by broad horizons of a generalist knowledge. As the competence to explore, present and represent human settlements (Ursu et al., 2019), we define spatial competence as the ability to survey and analyze human settlements from different thematic and theoretical perspectives, and enrich this ability in a domain of specialty.

3.2.1.2. Systems thinking. Systems thinking is another planning competence duly emphasized and disentangled by some researchers (Hammer, 2004; Gaber, 2007; Andersen et al., 2006; Gilliard et al., 2021; Phelps, 2024). Systems thinking involves a set of analytic abilities to identify and understand multiple elements, their interactions and functions as a system (Sotarauta & Hansen, 2024). Systems thinking is often assumed so ingrained in planning that it is taken for granted, but

Table 2
An additional set of 21 identified competencies for sustainable development mostly falling under Wiek et al.'s (2011) five key competencies (Authors).

Competence	Short definition in the main study	Other studies recognizing the competence	Reflection in Wiek et al.'s (2011) framework
Integrated problem-solving	"The overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options" (UNESCO, 2017, 10).	Brundiers et al. (2021); Günther et al. (2024)	Systems thinking
Self-awareness	"The ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires." (UNESCO, 2017, 10).	Günther et al. (2024)	
Implementation competence	"The ability to initiate and facilitate a process of transformation towards sustainability" (Venn et al., 2022, 17)	Brundiers et al. (2021); Günther et al. (2024); Redman and Wiek (2021)	Strategic competence
Transdisciplinary competence	"Ability to draw, in critical and integrative ways, upon multiple disciplinary frameworks to inform sustainability-oriented thinking and action." (Evans, 2019, 7)		
Creative and strategic competence	"Ability to collectively envision, develop, implement, and assess transformative interventions for sustainability.". (Evans, 2019, 7)		Anticipatory competence Strategic competence
Communication skills	"Ability to enable, facilitate, and motivate collaborative and participatory sustainability learning, thinking, and action". (Evans, 2019, 7)	Willard et al. (2010); Svanström et al. (2008); UNESCO (2017); Rieckmann (2012); Lozano, Merrill, Sammalisto, Ceulemans, Lozano (2017)	Interpersonal competence
Empathy, compassion and solidarity	Ability "…to work together to find future-compliant solutions to shared problems and to	Roorda (2010); Rieckmann (2012); Lans et al. (2014); Lozano, Merrill, Sammalisto, Ceulemans, Lozano (2017);	Normative competence

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Table 2 (*continued*)

Competence	Short definition in the main study	Other studies recognizing the competence	Reflection in Wiek et al.'s (2011) framework
	find responsible ways to achieve more justice." (De Haan, 2006, 24).		
Cosmopolitan perspective, transcultural understanding, and cooperation	"… curiosity about, and interest in, the experiences and affairs of people from other regions of the world, and the desire to learn from one another." (De Haan, 2006, 23).		
Interdisciplinary Collaboration	"The ability to structure relations, spot issues and recognize the legitimacy of other viewpoints … regarding environmental, social and economic issues… and to maximize the exchange of ideas and learning across different groups … and different disciplines" (Lans et al., 2014, 40).	De Haan (2006); Roorda (2010); Lambrechts et al. (2013); Rieckmann (2012)	
Foresighted Thinking	"The capacity to deal with uncertainty and future prognoses, expectations and plans … being able to think beyond the present." (De Haan, 2006, 22)	Frisk & Larson (2011a,b)	Anticipatory competence
Envisioning	The ability "…to engage in a meaningful interpretation of sustainability, linking and channelling this information into a shared common vision for the future.". (Tilbury & Wortman, 2004, 19).		Anticipatory competence
Critical thinking	"The ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability	Tilbury and Wortman (2004); Svanström et al. (2008); Rieckmann (2012); Evans (2019); Günther et al. (2024); Lozano, Merrill, Sammalisto, Ceulemans, Lozano (2017)	Normative competence

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Table 2 (*continued*)

Competence	Short definition in the main study	Other studies recognizing the competence	Reflection in Wiek et al.'s (2011) framework
	discourse". (UNESCO, 2017, 10).		
Futures thinking	"Ability to carry out or construct simulations, forecasts, scenarios, and visions" (Redman & Wiek, 2021, 6).	Brundiers et al., 2021	Anticipatory competence
Integration competence	"Ability to apply collective problem-solving procedures to complex sustainability problems" (Redman & Wiek, 2021, 6).	Svanström et al. (2008)	Systems thinking
Intrapersonal competence	"Ability to avoid personal health challenges and burnout in advancing sustainability transformations through resilience-oriented self-care" (Redman & Wiek, 2021, 6).		
Values thinking	"Ability to identify, map, specify, negotiate, and apply sustainability values, principles, and goals" (Redman & Wiek, 2021, 6).	Brundiers et al. (2021)	Normative competence
Justice, responsibility, ethics, and values	The ability to apply "concepts of ethics, justice, social and ecological integrity, and equity… negotiation, and reconciliation of principles, values, aims, and goals for sustainability" and display "responsibility for one's actions… ethics and sustainability of personal and professional behaviour." (Lozano, Merrill, Sammalisto, Ceulemans, Lozano, 2017, 4).	Rieckmann (2012); Lans et al. (2014); Roorda (2010); Mochizuki and Fadeeva (2010); Lambrechts et al. (2013)	Normative competence
Collaboration competency	"The abilities to learn from others; to	Frisk & Larson (2011a,b); Venn et al. (2022); Günther et al. (2024)	Interpersonal competence

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Table 2 (*continued*)

Competence	Short definition in the main study	Other studies recognizing the competence	Reflection in Wiek et al.'s (2011) framework
	understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving." (UNESCO, 2017, 10).		
Ability to deal with knowledge and Information	"the acquisition of new knowledge and information and the ability to deal with them. This meant being able to evaluate and classify knowledge and/or information and their sources." (Günther et al., 2024, 1659).		
Participation competency	"The ability to represent one's own interests and get involved with the development of transformation processes … collectivization and the negotiation of common goals within democratic structures." (Günther et al., 2024, 1659).		Interpersonal competence
Self-motivation and motivating others	"The ability to set yourself and your own culture in perspective and to gain new perspectives by encountering the strange and foreign." (De Haan, 2006, 24).		

many planning initiatives have failed to solve interconnecting problems of human settlements, resulting in limited or unintended impacts and unsustainable development paths such as poverty, environmental pollution, health risks, and degradation of natural resources over generations (Colledge, 2017). Zellner and Campbell (2015) note that planners have rather recently and hesitantly engaged in complex systems analysis to characterize metropolitan dynamics and wicked problems, such as the multiple conflicts over land and natural resources. Schmitt and Magnusson (2024) found that the manifold implications of climate change are bewildering for planners and challenging for educators to teach. Demssie et al. (2023, 261) note that "research is rare on fostering systems thinking competence by simultaneously using multiple, real-world, and innovative learning approaches." The barriers to systems thinking are both methodological and theoretical, requiring creative, iterative problem framing (Vasishth, 2008). Ziafati Bafarasat (2023) suggests that studio courses involve students in cross-impact analysis of problems to gain methodological skills to identify problems which drive other problems. Vasishth (2008) argues that planning education should utilize technology aided simulations, system mapping exercises, and other active learning methods to foster experiential knowledge that: "there is usually more than just one thing going on at the same time…some few aspects of a phenomenon usually matter much more than others, and… the physically tangible world that we care most about is usually shaped by apparently intangible sets of processes and functions… Under these conditions, planning becomes the informative telling of context, and the savvy tracing of consequence" (Vasishth, 2008, 99). As a planning competence, we define systems thinking as the ability to analyze human settlements between different domains (environment, equality, economy, public health, etc.) and levels (community, local, regional, etc.), whereby considering multiple systemic interactions in identifying and approaching problems (Andersen et al., 2006; Wiek et al., 2011; Goodspeed, 2020; Phelps, 2024).

3.2.2. Skills to plan sustainable settlements

Skills to plan sustainable settlements consist of envisioning competence, strategic competence, and interpersonal competence as follows.

3.2.2.1. Envisioning competence. Despite changes in planning culture, the outlook on the future is often less about visions and more about predictions derived from extensive databases and algorithms, transforming estimates of future needs and costs into tools that powerful interests use to justify their future projects to the public (Wachs, 2001). Reeves (2009) observes that planners often see what they believe is achievable, yet they must strive for creativity and think beyond the limited current perspectives, seeking visionary solutions to everyday challenges. Sachs Olsen and Juhlin (2021) urge planning professionals to adopt futurist approaches that shift from mere projection to a more reflexive engagement. Varış Husar et al. (2023) assert this shift in the approach to future is becoming more crucial as future planners will encounter numerous wicked challenges requiring bold responses. Tennøy et al. (2016) contend that in the past, the desired future was typically thought to be determined by the planners' employers, such as developers or political figures; however, it is now more frequently shaped collaboratively during the planning process in consultation with various stakeholders, often heavily influenced by the professional planners engaged. However, Phelps and Valler (2024) note that envisioning, as a core planning competence involving analytical and creative dimensions, is being eroded in planning profession. They argue this is reducing planning to administration science leading to narrowing of practice repertoires and a stifling of spatial imagination (Phelps & Valler, 2024). Pauw (2021) notes that envisioning requires advanced thinking associated with possessing the appropriate knowledge, skills, and imagination, but it also needs willingness to engage in spatial imagination as a meaningful practice. Ratcliffe and Krawczyk (2011) emphasize that planning courses should enable students to understand future complexities, predict upcoming changes, develop passion about the future, and envision multiple sustainable futures as viable alternatives to the existing limitations. Overall, we define envisioning competence as the ability to analyze and craft multiple spatial pictures of a more sustainable future (Rogerson et al., 2010; Wiek et al., 2011; Phelps & Valler, 2024).

3.2.2.2. Strategic competence. Evans & Rydin (2013, 57) define strategic competence in planning as "the ability to develop plans, policies and strategies for the future to meet specified goals.", but most others also consider implementation as part of strategic competence. Rondinelli (1973) is an early example for this who contends that graduates from planning education programs lack the necessary skills and experience to effectively plan for and guide urban transformation. A few decades later, Megahed et al. (2019) note that learning acquired at the university level does not align with the skills required in actual planning practice to drive interventions and urban transitions (Megahed et al., 2019). Reeves (2009) stresses that planners must demonstrate their ability to translate knowledge into practical and realizable outcomes (Reeves, 2009). Tunström (2018) warns that in educating future planners, there is a risk of overemphasizing feel-good concepts like sustainability and resilience without fully exploring their practical applications. She observes that current planning programs focus on communicative and project management skills but stresses the need to expand these tools to better equip planners to drive transformation (Tunström, 2018). The UN-HABITAT-convened initiative 'Planners 4 Climate Action', for example, found limited data on how climate change issues are addressed in urban planning practice (Hurlimann et al., 2021). Hurlimann et al. (2024) observe in their survey of urban planning professionals in Australia that they possess a strong sense of climate change knowledge, yet only a limited number apply this understanding to their professional practices. Andersen et al. (2006) emphasize that planning education should foster skills enabling students to design interventions situated in implementation dynamics. Ziafati Bafarasat (2023) suggests that plan-making studios should further emphasize identifying and assessing alternative courses of action and viability tests. He adds that plan implementation and placemaking courses should link with budgeting and financing skills, and set an approach for 'communication of implementation' (Ziafati Bafarasat, 2023). Strategic competence, which we define as the ability to design and drive interventions, urban transitions and spatial transformations (Reeves, 2009; Wiek et al., 2011; Evans & Rydin, 2013), in Ziafati Bafarasat (2023)'s view should be nurtured in interdisciplinary urban labs integrating the skills of physical design, policy integration, and institutional design. Firth et al. (2021) argue this enables planners to design with contextual forces that support (e.g. sufficient funding and resources, leadership support, community buy in) or inhibit implementation of any intervention.

3.2.2.3. Interpersonal competence. Effective communication and collaboration with stakeholders is a fundamental requirement of planning practice as highlighted by Friedmann (1996). Megahed et al. (2019) observe that the most crucial skills for planners are facilitating communication and enabling collaboration as planners often work in highly politicized environments where technical knowledge intersects with political priorities. Based on a survey of 638 planning, planning-related, and non-planning professionals, Guzzetta and Bollens (2003) found that communication skills are valued more than technical and quantitative skills across all three groups, although planners valued report writing and writing for the public more than planning-related and non-planning professionals. Caves and Wagner (2018) gathered insights from three experienced professionals on the skills planning students need to learn in their education. Two of these professionals, Paul Zucker and Lee Brown, argued that the ability to support collaborative action is crucial for planning practice. Butt et al. (2016) note that planners should also demonstrate an inter-cultural ability to facilitate communication

and collaboration across different cultures. Many researchers have highlighted the importance of incorporating group projects in plan-making courses, studio-based courses, or workshops to accurately reflect the collaborative nature of planning practice, focusing on how planners manage relationships and facilitate the flow of understanding, information and ideas between and among individuals and groups (Bina et al., 2016; Edwards & Bates, 2011; Ozawa & Seltzer, 1999; Galan & Kotze, 2024). Planners should be able to apply multiple forms of verbal, written and visual communication using multimedia and communications technology to simplify ideas, facilitate mutual understanding, and motivate engagement with and between interdisciplinary teams of practitioners, communities, and decision-makers, also enabling social dialogue with the hard-to-reach groups (Manta Conroy, 2004; Walker & Seymour, 2008). Salaj et al. (2010) note that these communicative abilities of planners could ideally present complex circumstances, results and ideas in a way that help achieve consensus among various, initially less understanding parties involved. Ozawa and Seltzer (1999) therefore emphasize that communication and collaboration are among the most valuable skills for planners to develop, and Čolić et al. (2023) find that collaborative platforms in urban planning education result in positive outcomes for students' interpersonal competence. We define interpersonal competence as the ability to motivate, enable, and facilitate the flow of ideas, information, and collaborative action (Wiek et al., 2011; Salaj et al., 2010; Oh, 2019).

3.3. Values to stand for sustainable communities

Although emphasized earlier by Marcuse (1976) and Friedmann (1996), the growing emphasis on values as a planning competence is recent in academic debates and professional requirements (Alexander, 2005; Campbell, 2012; Hendler, 2018a). Planners used to focus on professional ethics as a specific set of behavioral guidelines governing their interactions with the public, data sources, government officials, and among themselves coupled with remaining current in the practice of planning. However, planners are gradually becoming comfortable with a broader conception of their professional ethics and values (Wachs, 2018). This has taken place in the context of the affective turn and daily work professionalism in planning shedding light on the role of affective attachment to values as a planning competence (Bakko & Merz, 2015; Buser, 2014; Clifford et al., 2024). In other words, affect, and the 'body's capacity for being affected' (Marotta & Cummings, 2019), is approached "as potential, as practice, as technology" (Bakko & Merz, 2015, 7). Affective adoption of values about justice, the (built) environment, and sustainable development is believed to act as cognitive technology, enabling planners to make insider sense of stakeholder positions, beliefs and conflicts. It helps planners to understand the embodied norms that pervade socioeconomic structures, which in large give meaning to planning and the built environment policy process, thus immersing planners in the discursive and material environments they seek to improve (Howe & Langdon, 2002; Buser, 2014). It capacitates planners to negotiate and reconcile stakeholder positions by working on deep meanings and new solutions at the intersection of multiple norms (Buser, 2014). Emphasizing a departure from the role of 'mediative strangers' to the role of 'insider negotiators', affective adoption of values requires lived experiences by planners rather than sole attempts at generating affective "bubbles" through the engineering of feel atmospheres (Metzger & Tamm-Hallström, 2022). This aims to ensure that solutions of planners for situations of conflicting values and ethics are sensually situated in sustainable communities (Glackin & Dionisio, 2016; Marotta & Cummings, 2019).

The sense-making and mediating abilities resulting from affective adoption of sustainability values are not the only dimensions of normative competence. Alexander (2005, 94) broadly defines normative competence in terms of identifying and applying principles about 'what planning should be for'. He believes that planners should not only understand the values of stakeholders but also share values with them and stand for those values were appropriate (Alexander, 2005). Conflicting or specific values of stakeholders may create normatively ambiguous situations in which the professional ethics of commitment to public interest, social justice, and environmental protection should play out (Murtagh & Ellis, 2010). Affective adoption of sustainability values enables planners to take position based on actor-institutional understandings and power relations to give access to unheard voices and support environmental protection (De Blust et al., 2022). The capacity of planners to take stance for the values of justice and stainable development is enhanced in integration with their systems thinking competence as they progress on a path towards full humanness and planetary responsibility by expanding their wellbeing perspective from I / my family to planet Earth (Salonen & Siirilä, 2019). Also, planning courses should expose students to philosophical theories, situations of personal and shared experience, and affective, ineffable, and mundane moments in which to identify (with) sustainability values, adopt professional etiquette, and engage in reconciliation and issues of social justice (Alexander, 2005; Hendler, 2018b; Yi'En, 2014). As Jurkiewicz (2013) argues, the aim is to develop values sensitivity and ethics reasoning for justice, or normative competence, which we define as the ability to identify (with), negotiate, reconcile and apply stakeholder values for justice (Campbell, 2012; Wiek et al., 2011; De Blust et al., 2022). Fig. 2 displays a summary of planning competencies for sustainable development.

4. Transformative learning of planning competencies for sustainable development

This section starts with a conceptual introduction to transformative pedagogy for sustainable development. It then identifies, for the first time, three types of transformative learning activities illustrating them with original teaching examples of fostering planning competencies for sustainable development.

4.1. Transformative pedagogy

As Carter et al. (2014) note, to solve our lingering social and environmental problems, education of different subject matters should be oriented to a transformation in attitudes, behaviours, values, beliefs, and actions of learners. Transformative pedagogy is becoming the spotlight of education for sustainable development (Guajardo et al., 2008). It is a philosophy of education which combines the elements of constructivist and critical pedagogy, and which emphasizes the linking of schooling to capacitating and inspiring learners to take personal responsibility and professional action for social justice and planetary wellbeing (Khedkar & Nair, 2016; Farren, 2016; Botes & Barnett, 2022). While higher education struggles for a new vocabulary and sense of purpose in the 'end of knowledge' era (Barnett, 2000a), transformative pedagogy provides that purpose in sustainable development. It holds that learning outcomes should not only affect the time and context in which learning activities occur; learning outcomes should affect the way learners experience, conceptualise and interact with the world in many different contexts in permanent rather than temporary change (Hoggan, 2016). Teachers become purposeful co-constructors of personal, social, and professional identities of learners, and classroom becomes where identity is negotiated and constructed in proactive learning styles (Harrell-Levy & Kerpelman, 2010; Farren, 2016). The socio-affective domain is an important aspect in transformative learning, with affect referring to emotion or feeling for the society and the environment, and co-creation is another aspect (Farren, 2016), providing "space to each participant to contribute to the development of new knowledge, to develop their own voice, to make their own offerings, insights, to engage in their own action, as well as to create their own products" (Barnett, 2000b, 161). According to Davis et al. (2011), transformative pedagogy emphasizes a holistic approach to cognition and learning, engaging multiple intelligences (e.g., musical, bodily-kinesthetic, interpersonal)

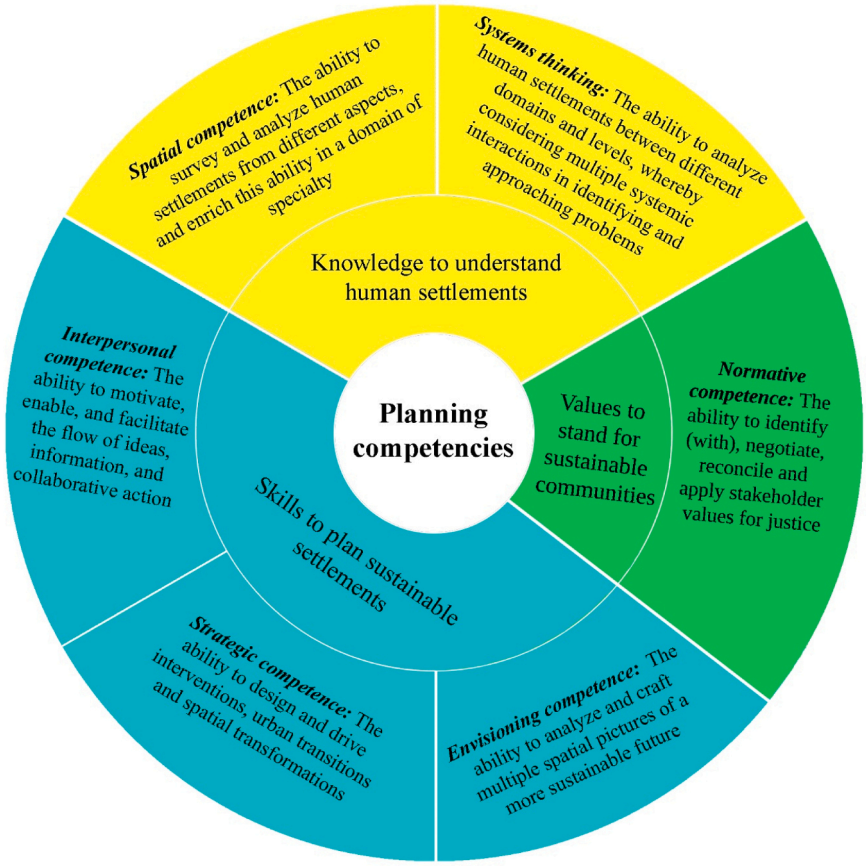


Fig. 2. Key planning competencies for sustainable development (Authors' elaboration).

beyond the traditional focus on linguistic and logical-mathematical intelligence often referred to as "academic" or "scholarly" intelligence (see Gardner, 1999).

The focus is on 'knowing' more than 'knowledge', with knowing being a collective process of inquiry, and knowledge constituting the stable outcomes of inquiry (Farren, 2016). Az Mezirow (2000, 8) argues, the focus of transformative approach is "…on how we leam to negotiate and act on our own purposes, values, feelings, and meanings rather than those we have uncritically assimilated from others - to gain greater control over our lives as socially responsible, clear-thinking decision makers." Mezirow's (1997) transformative learning theory, which forms the basis of this pedagogy, articulates the process through which learners are encouraged to reflect on their values and assumptions in learning new knowledge and skills, hence driving perspective transformations in learners in psychological, convictional, and behavioral dimensions. Influenced by Paulo Freire's (2015) ideas on critical consciousness, transformative pedagogy seeks to empower learners to understand and address societal challenges from a moral perspective. Freire's (2015) work emphasized the importance of dialogue and reflection in education, aiming to raise awareness of social issues among learners and to challenge the structures that perpetuate inequality. Transformative pedagogy interlinks meaning-making across various contexts, including classrooms, families, communities, and society at large (Fujino et al., 2018). According to Farren (2016), transformative pedagogy deliberately fosters connections between what learners experience in the classroom and their broader social worlds, including family, community, and society at large. By emphasizing the interconnectedness of various systems and the broader context in which they operate, transformative pedagogy encourages learners to move past viewing issues in isolation and instead recognize the complex dynamics at work within both natural and social systems.

Transformative pedagogy might be viewed on a spectrum of learning, interaction and change. Stanberry and Azria-Evans (2001) identify three primary pedagogical positions: transmission, transaction, and transformation. The transmission style focuses on the teacher delivering a set of facts or beliefs to students with minimal student involvement. While this approach allows for quick dissemination of information and flexibility for different audiences, it often leads to rote memorization rather than deep, meaningful learning. As a result, it does not facilitate critical thinking, nor does it promote the application of knowledge in real-world contexts. In contrast, the transaction approach emphasizes active student engagement through problem-solving and critical thinking. In this model, students take on an active role in their learning by asking questions and discussing ideas within a collaborative setting. This approach fosters a deeper understanding of material and encourages students to apply their knowledge in various contexts. Transformative pedagogy takes this reflective, collaborative process a step further by emphasizing self-awareness, and mutual learning between educators and students. It involves the active transformation of both the teacher and the students, where growth and change are intentionally instigated. Teachers aim to create a learning environment that reflects the voices and experiences of students, encouraging critical analysis and the constructive challenging of perspectives. This model promotes complex learning and the development of students' identities as they engage with and critically examine the material. The learning process, often strengthened by smaller class sizes, enables students to construct and reconstruct their understanding of themselves and the world around them (Greene, 2005; Harding et al., 2001; Harrell-Levy and Kerpelman, 2010). Transformative involves meaningful collaboration between students and staff in shaping curricula and pedagogy (Bovill et al., 2016). This interactive process not only values students as partners in teaching, learning and change (Bovill, 2020a, 2020b), but

also aims to reveal, analyze, and transform the interactional structures of higher education (Omland et al., 2025). This co-create process also aims to help generate alternative ideas and solutions by bringing together individuals from diverse roles, backgrounds, and experiences (Blau & Shamir-Inbal, 2018; Luckner et al., 2019). These practices span various domains - from curriculum design and teaching activities to assessment and the integration of students as tutors, teaching assistants, peer mentors, or staff partners (Omland et al., 2025).

According to Hoggan (2016), to distinguish transformative learning from other types of learning, three key criteria should be considered: depth, breadth, and relative stability. Depth refers to the significance and magnitude of the change. For learning to be transformative, the shift in a learner's perspective, worldview, or behavior must be profound, rather than a minor or superficial adjustment. It is important that the learning leads to a fundamental transformation in the way the learner experiences, conceptualizes, and interacts with the world. Breadth involves the extent to which the learning outcome affects various areas of the learner's life. Transformative learning impacts multiple contexts, such as personal, social, and professional realms, rather than being confined to the specific context in which it occurred. Relative stability highlights the permanence of the change. For a learning experience to be considered transformative, the change should endure over time with lasting effects on how the individual perceives and interacts with the world. (Hoggan, 2016). Transformative pedagogy offers the potential for significant shifts in both attitudes and behavior of learners (and educators). Instead of simply urging learners to improve their actions or outcomes, it encourages them to perceive the world in a new light and reflect on life purpose in the process of learning. This can lead to lasting changes in how learners think, reshaping their understanding and fundamentally altering their way of engaging with the world (Salonen & Siirilä, 2019). Along with its focus on life purpose and moral education (Moran, 2018), transformative pedagogy is oriented to problem solving, emphasizing critical reflection on problem premises to enable one's own understanding of problems and gaining the complex skills to engage with fundamental issues of justice and the environment (Mezirow, 2000).

Transformative pedagogy does not only focus on reshaping learners' values and attitudes but also fosters knowledge and skills that enable professional action for transition to a sustainable future. Frisk & Larson (2011a,b), for example, contend that transformative teaching promotes systems thinking or a comprehension of the intricacies that emerge within an interrelated system, along with enhancing the capacity to work together with individuals from various backgrounds, all while maintaining a forward-looking perspective. Peterson and Lundquist (2021) note that transformative pedagogy focuses on learning methods that ensure the depth and adaptive continuity of skills and knowledge, for example through learning activities like role-plays and photovoice assignments fostering critical thinking and independent judgment in situations of pressure and ambiguity (Peterson & Lundquist, 2021). Transformative pedagogy designs affection in learning activities to foster competencies, including in subject matters, emphasizing cognitive attachment beyond the learning context as essential for acquiring stable professional skills (Bay & Macfarlane, 2011; Khaled et al., 2014; Mulder & Dull, 2014). Transformative pedagogy engages learners in gaining knowledge and skills as whole persons, both intellectually and emotionally (Kohonen, 2013). In other words, competency in transformative pedagogy extends beyond skill acquisition to include shifts in perspectives and motivations, consistent with reflective practice and continuous learning, illustrating the developmental nature of transformative pedagogies (Council on Social Work Education, 2015; Mezirow, 2000). By encouraging learners to critically examine their assumptions about ways of doing things and actively participate in knowledge construction and application, transformative pedagogy holistically supports competency growth, effectively preparing learners for professional practice in untaught settings through ongoing self-reflection on experiential engagement (Peterson & Lundquist, 2021). Transformative pedagogy integrates affection with critical thinking in gaining competencies, for example in inquiry-led learning through new technologies and in relation to daily experiences of learners, to foster competencies (in subject matter) for sustainable development and support continuous professional development. It designs professional learning activities that enable learners to critique existing skills and ways of doing things and take action on the basis of their analysis (Sahakian & Seyfang, 2018). According to Tolkatser (2024), educators practicing transformative pedagogy must therefore aim to nurture mindfulness and a culture of continuous search for new solutions along with subject matter competencies.

Transformative pedagogy supports identity formation for sustainable development. Viewing identity development as a situated process evolving in daily interactions, transformative learning activities aim to stimulate profound shifts in how an individual perceives and understands their role in the world (Harrell-Levy & Kerpelman, 2010; Hoggan, 2016). According to Farren (2016), transformative pedagogy fosters an environment that helps both teachers and students (participants) develop their values, goals, social roles, and worldviews through examining and negotiating their relationships with one another and with the world. Professional identity formation is part of this wider process "to prepare graduates to understand deeply what their lives could be about in any full sense or what their places should be in the world around them" (Kaplan & Flum, 2012, 171). Transformative pedagogy promotes whole identity formation, integrating learning activities which have occupational pursuits with those consisting of the pursuit of beyond-the-self purposes or societal and environmental well-being (Yeager et al., 2012). For example, Doorn and Kroesen (2013) discuss the application of role-playing about a Dutch political controversy concerning pig transport in identity formation for engineering students. Latchem (2006, 42) argues that education in museum sites where "linear narratives ... and institutional presentations of history...are subject to reconstruction" by individual learners could support identity formation in subject matter and in relation to the society. Illeris (2014) notes that these different teaching methods should be tailored to align with students' individual life experiences and current contexts, creating a learning environment that supports the growth and evolution of their identities. Harrell-Levy and Kerpelman (2010) emphasize the role of teachers in identity formation and transformation is enabled by the community that is developed within the class and the personal relationship that is formed between the teacher and students aided by small class sizes. The concepts of "being-in-relation" and "being-in-becoming" describe this learning process, ultimately leading to a deeper understanding of oneself and one's role in the world (Farren, 2016). Teachers engage students in issues that are personally important and professionally relevant to them, often encouraging them to take position about these issues alongside their peers. By encouraging students to explore and express their identities through subject matter activities with direct societal relevance, teachers can have a meaningful impact on shaping those identities in relation to sustainability values (Harrell-Levy and Kerpelman, 2010). This approach aligns with the belief that education is not just about knowledge acquisition but also about transforming students' perspectives and lives, as emphasized by Freire (1973).

Despite the growing popularity of transformative pedagogy, less is known about its learning activities and empirical implementation in classroom. Taylor (2000, 2), for example, notes that: "My earlier, extensive review of the research on transformative learning revealed that concepts of promoting and fostering transformative learning are the least empirically investigated". With this observation echoed by more recent studies (Farren, 2016), the rest of this section synthesizes from the literature three interrelated types of learning activities in transformative pedagogy. Each type of learning activity is followed by original case examples to illustrate its application in fostering planning competencies for sustainable development.

4.2. Transformative learning activities: Fostering planning competencies for sustainable development

This sub-section identifies three interrelated types of transformative learning activities, including (a) unlearning-relearning activities, (b) learning through new experiences, and (c) learning through ill-structured problem solving. Each type is first discussed in conceptual terms and then followed by original case examples of its application in planning education for sustainable development. While most case examples display an integrated application of the three types of learning activities, they are discussed under individual types for illustration purposes and depending on their focus.

4.2.1. Transformative pedagogy involves unlearning-relearning activities

Linked with transition from unsustainable routines toward social justice and sustainable practices, 'unlearning' activities is a focus of transformative pedagogy (McLeod et al., 2020). Unlearning, or "abandoning obsolete beliefs, values, knowledge, and routines" is essential for transformative learning because existing knowledge, perspectives or habits can act as barriers to new learning (Matsuo, 2019, 465). Also, in many cases students undergo "accumulative learning", where they gain knowledge and skills while retaining previous knowledge and perspectives, meaning that the process of learning does not always necessitate unlearning (Matsuo, 2019). Williams & de Galarce (n.d.) argue that for new learning to take place in meaningful ways and transform practices, educators should first design unlearning activities which drive students to question their existing views and knowledge. This enables students to identify what they need to discard, which allows for new, more equitable and sustainable viewpoints to emerge (Williams & de Galarce, n.d.). Silova et al. (2025, 20) acknowledge that unlearning requires a "release, surrendering, or putting down of what one had previously worked so diligently to acquire". Macdonald (2002, 170–171) notes that unlearning is a difficult process, involving "changing an ecological system of feelings, thoughts and behaviors, that triggers a process of grieving… to unlearn a trusted … practice prior to learning new … practices". This, Macdonald (2002) concludes, highlights the importance of providing a safe, co-creative space for unlearning with caution against rushing in unlearning activities.

Unlearning does not only involve views and values, but it also includes skills and practices that could have been useful in the past but may now be redundant or even harmful to sustainable outcomes (McWilliam, 2008). Its ultimate goal is to encourage individuals to stop certain behaviors while also promoting the adoption of new practices (Macdonald, 2002, 173). According to Silova et al. (2025), for instance, "development" must be unlearned in education. They advocate for a transformative pedagogy that enables students to challenge the presumptions that underpin development projects, which have been historically normalized as the only way to know, and the only way to become and to do (Silova et al., 2025, 20).

McWilliam (2008) argues that following a transition in the role of educators from 'sage-on-the-stage' to 'guide-on-the-side', transformative pedagogy now requires educators to undergo another shift to become 'meddler-in-the-middle'. This shift positions the educator and learner as mutually involved in disassembling and reassembling knowledge and cultural products (McWilliam, 2008). Tims (2014) provides examples of activities which educators can design to support unlearning, like engaging students in deconstructing information, observations and images, asking them to evaluate a previously accumulated body of evidence, and incorporating research methods into class and group projects. Williams & de Galarce (n.d.) argue that experiential learning exposing students to new encounters could challenge their conditioned responses and preconceived notions. Conner (2010) found that service learning might be designed to provide an unlearning experience for students to develop greater sensitivity, feel uncomfortable with preconceived notions, and excavate their perspectives. Trent (2010) found that action research could drive learners to contest previously held perceptions, their images of their roles and others', and their alignment with roles that they should undertake. Ritsema et al. (2011, 89) observe that the city could become the classroom for unlearning when activities require students to hear, see and experience the city from other people's perspectives, shifting "from faculty and books to host families, government planners, urban recyclers, shopkeepers, developers… people with a range of extraordinary and ordinary experiences and views on their city." Finch et al. (2024) argue that learning activities which concern future scenarios provide a context for unlearning. Future scenario activities require alternative perspectives that are difficult or even impossible to stimulate within current frames of reference, hence putting to scrutiny and question current perspectives with the help of future horizons (Finch et al., 2024). Chukwuemeka and Garba (2024) argue that the use of technology in education supports unlearning by enabling students to identify misconceptions or outdated information through real-time access to current information. For example, online collaborative platforms enable students to engage with evolving best practices and unlearn redundant routines (Chukwuemeka & Garba, 2024).

Tims (2014) suggests a sign that unlearning has taken place is to improvise and innovate in search of re-learning. Williams & de Galarce (n.d.) argue that in relearning students should be guided to apply creative forms of expressing new knowledge, such as crafting poetry, narrating stories, creating music, producing visual artwork, or performing theatrical pieces to not return to the same learning and keep subsequent unlearning open through more flexible frames of mind and expression. This unlearning-relearning path, also called double-loop learning cycle, in Silova et al.'s (2025) view describes how sensing failure can trigger a journey of grief, dismantling harmful or redundant views, and consequently driving a transformation not just in our perceptions of the world, but also in various elements of our practices and our life approaches.

4.2.1.1. Example: unlearning neoliberal foodscapes through action research. The International Module in Spatial Development Planning (IMSDP) is an intensive postgraduate 12 week research- and practice-oriented training programme at KU Leuven. It involves an action research project encouraging students to unlearn neoliberal foodscapes (Ismai, 2025) associated with the state and agri-food companies, and relearn sustainable food production, expressing this relearning by art-based ways of knowing. The module, whose action research products[3] won the 2020 prize of the Flemish Young Academy, applies a transformative pedagogy fostering planning competencies for sustainable development.

In 2021 and 2022, IMSDP students and researchers engaged in action research with local stakeholders on the governance of the city of Leuven's food strategy. IMSDP draws on literature on transdisciplinary action research, promoting a practice-focused approach to transdisciplinary inquiry and collaborative problem identification among researchers, practitioners, and stakeholders. Action research, in a broader sense, is a critical approach to research founded on the epistemological conviction that integrating various forms of knowledge and experiences, while fostering equitable relationships between researchers and their "subjects of study," can enhance the co-creation and democratization of socially relevant knowledge, as well as empower the individuals involved in the research process. (see Medina-García et al., 2022a). In the academic years 2020–2021 and 2021–2022, IMSDP tutors engaged students from the IMSDP, as well as students from the elective course Institutional Aspects of Spatial Planning and 4 master thesis students, in a four-stage process with local food related stakeholders, enhancing students' normative and interpersonal competence through this innovative engagement.

[3] Published on www.insist.earth and the Leuven Gymkhana website. INSIST Cahier 4 'Anticipating Life after the COVID-19 Pandemic'

The action research, in which students and tutors worked as a team, involved a wide range of participants from the city, such as citizens, experts, academics, those involved in alternative food system practices, coordinators from the public-civil partnership Leuven2030, and local politicians and civil servants. The process consisted of: collective unlearning and reflection moments on the topic, studying relevant literature, contextualizing the case study and co-defining the next steps; reaching out to stakeholders to negotiate the guiding research questions; fieldwork and informal talks with local food actors like community supported agriculture, cooperative food markets, local conventional farmers, neighbours with community gardens, etc.; developing ideas and preparing a proposal for intervention, and reaching out to stakeholders to discuss this; implementing the intervention and inviting stakeholders to join; and post-processing by making and publishing an INSIST cahier on www.insist.earth and the Leuven Gymkhana website.

The process of action research involved multiple practices fostering envisioning competence, strategic competence, and interpersonal competence of learners. In the first stage of the process students and tutors produced the so-called Leuven Gymkhana, a treasure hunt guided by posters in the city, positioned near emerging alternative food practices, to draw attention on the importance of the latter for the city's food strategy. In the second stage, students continued the work and transformed the Gymkhana into guided walks, for which full scripts were written, and which supported a dialogue with the city regarding public-civil collaboration in food governance (Medina-García et al., 2022a, 2022b). The third stage led to the public production, projection and discussion of a documentary made by the students, based on a series of interviews with stakeholders in the city's food strategy. In the fourth stage, the focus changed to food strategy related land policies. Tutors and students submitted a proposal to the city's Open Call for Sustainable Food Practices aimed at acquiring a use right over one of the city's plots of land, which again fed discussions with food strategy stakeholders (Katsigianni et al., 2023; Van den Broeck & Katsigianni, forthcoming), especially during a final public event.

During the consecutive action research stages, students analysed the city of Leuven's food strategy, agricultural practices, land policies and governance frameworks, linking with the city's spatial structure and planning. They mapped locations, designed trajectories for the guided tours they planned and implemented, and did fieldwork on food strategy related locations. The different generations of students gradually built a better and more holist understanding of the historical trajectories of alternative food practices versus predominant agricultural mechanisms, as affected by the state and the market. They constructed actor-institutional timelines providing a deeper insight into the dynamics of food governance in Leuven, linking geography and ecology, economic aspects, political aspects and discourses regarding agriculture and food.

Students were challenged to evaluate who benefits from the dynamics they analysed and take an ethical, organisational and socio-political position in these dynamics. Students focused on food sovereignty, short food chains, community based initiatives like community supported agriculture, and how the city could support these. Students challenged the way the city seemed to favour efficiency oriented definitions of sustainability and collaborations with powerful stakeholders in food production. They did so through the various outputs, including the timelines showing a gradual increase in distance between city and alternative food practices, the guided tours showing the importance of bottom-up practices, the public presentation of the documentary showing diverging views on the city's food strategy, and the critical participation in the city's Call for Sustainable Agricultural Practices. In each stage, the goal of the action research was to come to proposals to address the problem they identified, through the interventions they were asked to design and implement. Each intervention questioned and/or expressed ideas about a sustainable future, in this case of food governance and public-civil collaboration in Leuven. Each stage included an in-depth analysis of involved actors and their drivers, logics, coalitions, oppositions, interests, values and power, the results of which were included in the analysis of food governance dynamics and the proposed and implemented interventions, while aiming to question the power of predominant agro-industrial and hierarchical governance practices. In short, students unlearned trusted views and values, and routine skills and practices involved in the foodscapes of Leuven, relearning alternative bottom-up practices through collective improvisation and reflection in action research, hence enhancing their planning competencies for sustainable development in a transformative process.

4.2.2. *Transformative pedagogy involves learning through new experiences*

Transformative learning is rooted in critical reflection on new experiential practices which could then lead to perspective transformation (Peterson & Lundquist, 2021). Taylor (2008) describes an example of a perspective transformation by Marie Claire, an American, who reflects on her experience of moving to Switzerland for a few years: *"I was very sheltered before [moving]. I think it made me aware of the fact that there are people who do things differently"* (Taylor, 2008, 6). Taylor (2008) argues that central to Marie Claire's transformation was her new experience, critical reflection on that experience, and engaging in dialogue with others about the new experience.

According to Paul and Quiggin (2020), transformative pedagogy is inherently experiential, focusing on providing new and profound learning experiences, for example through role plays, games, case studies, critical incidents, simulations such as "in box" exercises, socio-drama, values clarification exercises, semesters abroad, field trips, and engaging students in an interdisciplinary project, that lead to both epistemic and personal shifts (Lewis & Williams, 1994; Paul & Quiggin, 2020). Taylor (2000) notes that the learner's experience serves as the foundation and the subject matter for transformative learning, particularly as new experiences are deconstructed and acted upon in group learning activities to provide the gist for critical reflection. White and Nitkin (2014) describe the design of an interdisciplinary initiative to support transformative learning by immersing students in a project to tackle a pressing social issue, such as poverty or hunger, and create actionable solutions to the problem. Morgan (2010) argues that locations and experiences that allow for an encounter with otherness - be it through diverse cultures or the natural world and wilderness - hold considerable potential for transformation. Simm and Marvell (2015) note that new and unfamiliar environments are transitional in nature, requiring learners to create their own relationship within that environment, and offering disruptive learning spaces that challenge students to 'make sense' of what they are experiencing. Foo and Foo (2022), however, note that transformative learning from new experiences requires some structure, and educators should design reflective assignments and activities in connection with the new experience. Fenwick (2003) argues that teachers should focus on excluded realms of experiential learning that do not correspond to routine knowledge categories and familiar distinctions (e.g., in space and time), hence enhancing disruptive learning spaces and their transformative outcomes. Transitional landscapes and environments, for example, could provide such case studies in which new experiences become multidimensional and complex, requiring learners to undertake their own synthetic reflection valuable for application in untaught situations (Beukers & Bertolini, 2021).

Grındsted et al. (2013) provide a typology of experiential learning through fieldwork, including fieldwork as a metatheoretical perspective, as an outdoor laboratory, and as a sensuous realization. In fieldwork as a metatheoretical perspective, the intention is that through fieldwork students learn how to operationalize theory. In the second and third types, the fieldwork experience should provide 'new' and original encounters, hence these two types of fieldwork are critical in transformative learning for sustainable development. In fieldwork as an outdoor laboratory, fieldwork learning is associated with the act of structured data collection situated in context, time and scale, meaning that students follow pre-set academic procedures to examine new experiences. In fieldwork as a sensuous realization, learners are provided

with an ad hoc, informal, and impulsive adventure into unknown places "sometimes hovering on the margins of consciousness, a sensibility ecumenically attuned to all innovations in the sensed environment, to every manner of loss, gain, and the unexpected, dedicated to absorbing a dynamic world without a set agenda" (Grındsted et al., 2013, 20). Golubchikov (2015) argues that in fieldtrips and fieldwork it is the new engagement lens that is sometimes more important than the new site encounter because, contrary to common expectations, fieldtrips may have unintended consequences, sometimes reinforcing existing misconceptions and frames of references. Golubchikov (2015) suggests that feel-trips offer a new approach (students' affective sense) to engagement with the site experience.

Coghlan and Gooch (2011) suggest that volunteer tourism, a form of alternative tourism that provides new experience for the volunteer tourists along with serving the hosting entity and the natural or social environment of the project, could be applied as a learning activity in transformative pedagogy. Paul and Quiggin (2020) notes that for an experience to be transformative, it must involve something a person has never encountered before, bringing about a discovery that changes their core personal preferences and the nature of their lived experience. Botchwey et al. (2009) found that interdisciplinary projects in city planning and public health involving students in action learning, or learning by doing followed by reflection on outcomes, could provide new learning experiences leading to transformative outcomes. Paul and Quiggin (2020) notes that new experiences could lead to an epistemic transformation in learners, expanding their psychological capacities and unlocking new ways of understanding the world. As a result, learners undergo significant changes in their values, views, and approaches, fundamentally altering how they interact with themselves and the world around them (Paul & Quiggin, 2020).

4.2.2.1. Example: feel-trip learning. City Development and Urbanism is a compulsory module in the master's program in Planning, Place, and Process at the University of Agder. The module involves a feel-trip supporting transformative learning of planning competencies for sustainable development.

The module offers an exercise in gaining insights into urban life and fostering spatial competence, normative competence, and systems thinking by using our senses and bodies as tools for exploring different places, and it invites students to reflect on how embodied knowledge can lead to a deeper understanding of the urban environment in relation to contemporary planning practices, hence also supporting skills to plan sustainable settlements. The feel-trip, called fieldwork of place-based sense-making in this module, was developed in response to concerns raised by the instructors that, despite the emphasis on relational knowledge and place-sensitive planning (Graham & Healey, 1999), place is predominantly studied through abstractions—via theories on space and place, maps, planning documents of various kinds, and occasional excursions where an external actor presents their interpretation of a place, its potentials, and its issues. Rarely are students encouraged to physically embed themselves in a particular place and community for an extended period. The unarticulated, everyday lived space is frequently overlooked. The module aimed to engage learners in unnoticed everyday atmospheres, materialities, rhythms, activities, and power relations that shape places, whereby fostering situated knowledge and values that are essential to envision and drive sustainable urban transitions in a co-creative process. The development and praxis of the feel-trip was co-creative and supportive of inter-personal competence, building on the idea of reciprocity between students and instructors.

The module, as conducted in 2024, centered on a week-long feel-trip to the Hovinbyen neighborhood in Oslo. In preparation for the fieldwork, students attended lectures outlining five overarching approaches to understanding space and place: i) psychogeography and drifting, ii) mental mapping, iii) strolling, or being a flâneur/flâneuse, iv) street phenomenology, and v) rhythm analysis, with readings by and about Guy Debord, Kevin Lynch, Walter Benjamin, Michel de Certeau, and Henri Lefebvre. Students were then organized into five groups, each tasked with studying one approach in more depth and delivering a classroom presentation on how their approach could inform, enrich, challenge or influence contemporary planning practices. The same groups carried over to the feel-trip component. Additionally, students were asked to select and read literature related to several concrete tools for use during feel-trip, such as photography, map drawing, recording/listening to soundscapes, and go-along interviews (Table 3).

To aid the students' observations, they were provided with examples of themes and elements to look for, such as repetition vs. non-repetition, flows and stops, disturbances, social interactions, spatial organizations, symbols and signs, and the relationship between places and power. Additionally, they were given examples of common urban codes, inspired by Mikoleit and Pürckhauer (2011), to observe, such as: "people walk in sunshine," "places of concentration depend on places of emptiness," and "shops lead people." These examples offered students a starting point for what to pay attention to during their fieldwork.

To foreground the approaches and methods themselves, students were instructed not to research the excursion site, Hovinbyen, in advance. Instead, they were encouraged to enter the field in a state of "blissful ignorance," unaware of the social and material issues planners sought to address. Equipped with pens, pencils, cameras (or phones), and recorders, the students were given free rein in a large area to discover their own spaces and places of interest. Their only guide was the overarching approach they had chosen, which helped direct them to places where they would spend the next week conducting their observations.

The week-long fieldwork concluded with half a day of student presentations, during which they shared the material they had collected, reflected on the place they had embedded themselves in, and assessed the merits of their chosen approach and tools, especially in relation to more conventional planning tools and practices, hence applying their innovatively gained spatial competence and normative competence in refining their strategic competence. For example, one group reflected on the dominance of a car-based rhythm over pedestrian use of a square, highlighting how planners may have underestimated the rhythms created by commuter- and car-based consumption in their attempt to design an attractive and relaxing square (Fig. 3). However, this focus on deep sensory survey had some disadvantages. A few students suggested that alongside their embodied exploration, they examine local media and social media groups to uncover pressing issues in the area, also engaging with local residents and organizations in this process to gain a broader understanding of the place, hence strengthening the role of interpersonal competence in gaining spatial competence and normative competence. In the second half of the day three planning actors -representing municipal and private sector perspectives - were invited to give a presentation and participate in a discussion on how they have approached planning in the area and the future of Hovinbyen. This allowed the students to compare and reflect on their own findings and interpretations of the place in relation to the formalized and structured planning processes underway in Hovinbyen, refining their learning in envisioning and strategic competence.

4.2.2.2. Example: learning through roleplay. Planning Powers and Procedures is a compulsory master's level module on the MSc Planning program at the University of Manchester, as well as an option for several other related master's programmes. It provides learners with the new experience of a professional roleplay about a planning topic close to their personal needs, actively engaging students as whole persons in identity formation and position taking for social justice and environmental protection, hence supporting transformative learning of planning competencies for sustainable development.

Delivery of the module is through a series of lectures, workshops and group tutorials. Students are taught how plan policies are developed and

Table 3
A table from the feel-trip guidebook encouraging students to select multiple techniques for data gathering within their overarching methodological approach.

Approach Technique	Drifting	Mental maps	Strolling	Street phenomenology	Rhythm analysis
Photography					
Drawing maps					
Recording soundscapes					
Go-alongs					

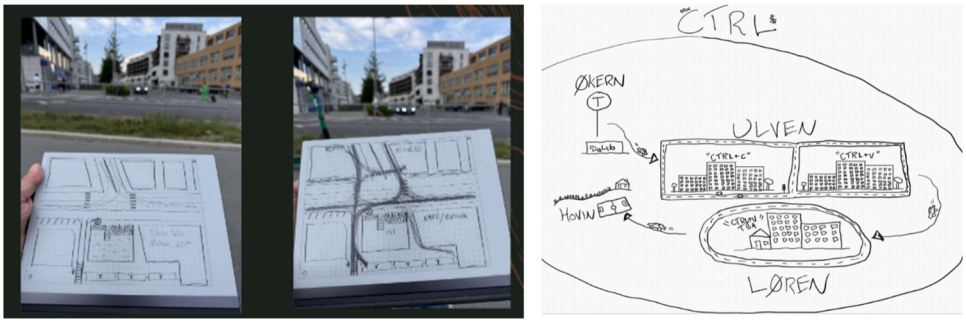


Fig. 3. Students reflecting on and communicating their new experience (a rhythm analysis of car flows and a mental map of a monotony). They relied on their senses and bodies for spatial competence and interpersonal competence reflected in this figure.

implemented and their relationship with development management within the framework of English planning law. One of the learning and assessment activities of the module is a role-playing exercise in which groups of students build a case for or against a development proposal. In doing so, they set out arguments as written evidence but also defend these under cross-examination within a 'mock' planning inquiry. This learning activity in particular aimed to foster interpersonal competence, normative competence, and strategic competence (how plans are implemented) of students, as well as systems thinking about the complex development proposal, as discussed below.

Housing provision and green belt protection are a notable reflection of conflicts at the community and political levels between social and environmental sustainability. The development proposal in the mock planning inquiry is hypothetical but closely linked to a real-life application for residential use of a former aerodrome site in the green belt on the southern edge of Stockport Metropolitan Borough Council (MBC) in Greater Manchester. This is one of the most affluent parts of the North West region and sites for new residential development much are sought after by developers. Woodford Aerodrome was a former private airfield and aircraft factory that supplied military aircraft including Avro Lancaster and Vulcan bombers. It was closed by its owner, BAE Systems, in 2011 and immediately became of interest as a potential major housing site. The aerodrome lies within the designated green belt. Although this would normally mean development is not allowed, there is provision under national green belt policy for the reuse of previously developed sites. The aerodrome site, including its former runway, includes land within Stockport MBC but also extends into the neighbouring local authority District of Cheshire East. A joint venture by Avro Heritage Ltd, Harrow Estates and Redrow Homes led to a planning application for 950 homes in 2012. This application only covered the part of the aerodrome within the Stockport MBC area. The Council had already identified the former aerodrome site as potentially partly suitable for housing and prepared a development brief for it. However, the application involved a significantly larger number of houses than the brief which had also mainly concentrated new development in parts of the site previously occupied by aerodrome hangars and buildings. Determining the application proved controversial with substantial local objection to the scale of the proposed development, its potential lack of affordable housing and its potential impact on the openness of the green belt, transport congestion and local services. However, Stockport MBC was minded to approve the scheme following an initial split decision by elected local politicians (Councillors) and a casting vote in favour of approval by the Chair of the relevant Committee. As a major housing development in the green belt, UK Central Government considered whether to 'call-in' the application and hold a public local inquiry rather than allow Stockport MBC to approve it. However, Ministers decided not to do so and permission was granted. Most of the site has now been developed with market housing ranging in price from around £ 0.5 million up to well over £ 1 million for the largest detached properties as well as a small number of apartments and some 'affordable housing' (either for rent or sold at lower than market price). The scheme was marketed as Woodford Garden Village and incorporates large areas of landscaping as well as a heritage museum charting the history of Avro and the aircraft they built.

For the purposes of the mock inquiry exercise with a particular emphasis on learning through less usual encounters with conflicting values and interdependence, a hypothetical residential proposal was created for a further 850 houses (including 20 % 'affordable') on the part of the former aerodrome that extended beyond Stockport MBC into Cheshire East District Council. This included much of the original concrete runway and extended eastwards towards the settlement of Poynton. The type of houses, scheme design, layout and landscaping matched that of Woodford Garden Village. This time, it was assumed that central Government had called-in the application and it would be determined after an independently chaired Public Local Inquiry (a role played by course tutors).

Students were divided into groups of around 4–6 per group, having split the class into two separate Inquiries. Each group had a different role-playing identity: Applicants; Cheshire East Council (2017); neighbouring Stockport MBC; Greater Manchester Combined Authority (GMCA); Local residents (objectors) group; the Campaign for the Protection of Rural England (CPRE); and the Home Builders' Federation (HBF). Lots were drawn to allocate the roles assigned to each group. Groups were to emphasise issues that would be appropriate to their role (e.g. the local objectors might take particular account of local impacts; GMCA might consider strategic issues; Stockport MBC might assess the impact the scheme might have on their Council's area). For some groups, their stance (for or against) was obvious from the outset (Applicants and HBF in favour; Local Objectors and CPRE against). These learners had the challenge of taking a position with which they might have less sympathy, a less common experience that is essential for students to

enhance their normative and interpersonal competence. Since, in real life, Cheshire East Council (2017) has adopted policy that stated the proposed site was to remain in the green belt or 'safeguarded' from development, this group were also opposed to the proposal. Students in the other two groups (Stockport MBC and GMCA) could choose whether to support the proposal or not (interestingly, across different inquiries over a number of years they have often chosen differently). For these students, the normative challenge was to take the 'right' position for the society and environment. There was a need to consider all relevant issues and a realisation that there were not necessarily any clear right or wrong positions, thus also supporting higher order thinking toward strategic competence and plan-making or implementation. The assignment brief required each group to prepare written evidence outlining their case for or against the development. The written evidence was submitted at least one week before the scheduled Inquiry and each group's report was then immediately made available to all other groups, allowing the other groups to see, and deeply reflect on, opposing arguments, also educating students about the institutional procedures for just and transparent agonism. This mirrors a real-life process whereby all parties supply statements of case prior to the Inquiry. The design of information exchange prior to the mock inquiry therefore also supported strategic competence of learners (development management procedures) in a transformative learning activity tied to their sense of desire for justice.

4.2.3. Transformative pedagogy involves learning through ill-structured problem solving

Transformative pedagogy involves problem solving activities that start with critical reflection on the underlying assumptions and premises that shape how problems are understood and addressed. Mezirow (2000, 20) argues that transformative learning requires problem solving by "defining a problem or by redefining or reframing the problem." This type of learning has direct relevance to the attributes of the transferable skills that are increasingly being sought in graduates, but it also supports social and environmental sustainability by enabling learners to rethink issues and consider multiple solution pathways. According to Mezirow (2000), transformative learning goes beyond learning to solve complex problems in real-life contexts; it also requires learners to critically examine and question the beliefs and frameworks through which they perceive various situations. It encourages learners to reflect critically on the broader context of problems, trying to explore root causes rather than just surface symptoms, which leads to a more comprehensive understanding of complex issues and the development of more systematic solutions. The focus on rethinking problems aligns with epistemic cognition, involving reflection on the nature, limits, and social construction of knowledge itself, prompting learners to reconsider their assumptions as they engage with problem-based tasks (Mezirow, 2000).

Acknowledging that most of the problems that we confront in life are not well structured (Goel, 1992), transformative pedagogy exposes learners to ill-structured problems, pushing them to move beyond habitual thinking patterns and engage in reflective discourse that challenges both their own and others' assumptions (Mezirow, 2000). While well-structured problems are bound in nature and solutions, ill-structured problems, such as climate change and poverty, are open-ended, divergent and have multiple solution pathways (Laxman, 2012). In learning through ill-structured problem solving, the problem task at hand is not defined in sufficient detail, and some of the main inputs are omitted on purpose, requiring learners to struggle to get to the definition of the problem before starting to solve it (Božić et al., 2014). Sometimes learners are exposed to highly ill-structured problems, requiring them to reflect on all problem premises, including *choosing and* defining the problem in a broad problem space considering their *values and* knowledge. In either case, an ill-structured problem lacks clarity regarding the relevant variables and their functional relationships, but the goals are also uncertain in highly ill-structured problem solving (Pereira Pessoa, 2023). The goals, means and results of problem solving could vary depending on how the problem situation is understood, meaning that it is important to understand problem premises in the process of solving ill-structured problems, unlike well-structured problems (Cho & Kim, 2020). Mezirow (2000) notes that attention to problem premises will help learners reshape their frames of reference as unjustified or unconscious beliefs are critiqued and replaced with more reliable perspectives (Mezirow, 2000). These frames of reference, which can be individual or shared paradigms, shape judgment values for individuals in navigating their position in the society (Mezirow, 2000).

The process of solving well-structured and ill-structured problems involves differences in the phases of representing, solving, and monitoring, with multiple representations and solutions for ill-structured problems, but there are additional phases of justifying and evaluating in solving ill-structured problems. Ill-structured problems are in principle "good problems" in transformative pedagogy due to the depth, breadth, and relative stability of their learning outcomes, fostering interdisciplinary knowledge, soft skills and values that transfer to other problem situations (Cho & Kim, 2020). Asking whether the solving of ill-structured problems can be taught as a learning activity, or learners can only develop this ability through time and experience, Bennett (2002) argues that the most important activities in ill-structured problem-solving are those occurring at the very beginning: those involved in defining the problem, and this is where teachers should focus their mentoring attention. Pee (2020) argues that the multiplicity of ill-structured problems is a challenge to individual learners, but it can be managed and leveraged to enhance transformative learning through co-creation in group projects. Lewis et al. (2018) suggest that collaborative projects of ill-structured problem solving should consist of learners from different disciplinary backgrounds to bring in multiple perspectives required to approach these problems. Božić et al. (2014) note that having real clients for ill-structured problem solving projects of students would help reflect situational tradeoffs and live societal dynamics in learning, but real clients are often driven by set agendas. By providing some problem premises, particularly the goals or values, this could turn the task into moderately ill-structured problem solving. A moderately ill-structured problem, such as car-dependent mobility, often inputs agreement on the values or goals, but involves uncertainty about the knowledge aspect of the problem, like how to tackle car dependent mobility (Echt, n.d.). Socio-technical problems such as the problem of stormwater management or congestion are archetypal examples of moderately ill-structured problems in the context of agreed values with potential real clients (McCuen, 1983). However, a more reflective task might turn a problem like stormwater management into a highly ill-structured problem to enable questioning of a management (as opposed to adaptation) approach to nature.

Basadur et al. (1994) note that the problem task should fit the problems faced in day to day life and work of learners. Arguing that solving ill-structured problems in real-world involves iteration to enrich problem representations, Lewis et al. (2018) reflect on an extracurricular undergraduate design course involving interdisciplinary project teams working iteratively on ill-structured problems. They found that teachers should provide additional coaching toward integrating iterative practices of ill-structured problem solving together. Mezirow (2000) argues that, where undertaken in a supportive learning environment, ill-structured problem solving not only empowers learners to face complex, real-world problems but also helps them to liberate themselves from 'problematic' problems by fundamentally rethinking the frames of reference on which those problems are based, cultivating a deeper, more nuanced, and critical perspective essential for meaningful and effective action for sustainable development (Mezirow, 2000).

4.2.3.1. Example: highly ill-structured problem solving. The Graduate School of Innovation and Practice for Smart Society at Hiroshima University offers a course in *Urban Policy*, focusing on urban climate policies. Through highly ill-structured problem solving requiring learners

to *choose and* define an urban problem before proposing solution pathways justified and evaluated against systems dynamics, the course fosters transformative learning of planning competencies for sustainable development.

This 15-session course puts an emphasis on systems thinking and strategic competence as it equips students with an understanding of the systemic effects of climate change on urban areas, along with a broad array of strategies for adaptation and mitigation. Central to the course is the concept of systems thinking in relation to sustainable development, and applying this knowledge in defining and approaching problems that cities are facing. The course advocates a paradigm shift in problem solving that necessitates adopting a holistic approach by understanding and considering multiple interlinkages across different building blocks of a problem (Hammond, 2003). The course draws on the premise that as urban challenges are typically intricate and interconnected, solving one aspect of a problem may inadvertently create issues in other areas. Despite the understanding that cities should be viewed as interconnected "systems-of-systems", there is still a prevalent use of urban research, policy, and practice methods that isolate complex problems into smaller parts, addressing them separately (Sharifi et al., 2023). The course stimulates fundamental reflection on problems before engaging students in problem solving, enabling students to reconsider their frames of reference and see the bigger picture in driving urban transitions.

The course begins with a series of five foundational sessions led by the instructor, who introduces the basic theoretical concepts related to climate change. These include its causes, impacts, and the array of urban adaptation and mitigation strategies available. To support these lectures, a variety of informational sources are provided, such as textbooks, the latest climate reports of the Intergovernmental Panel on Climate Change, and interactive tools like maps and scenarios. These resources serve to not only inform but also actively involve the students. They are encouraged to draw upon their own experiences, providing examples of climate adaptation and mitigation from their local contexts, and to use climate scenarios to visualize potential future scenarios and hence improving their systems thinking and envisioning competence in integration.

Transitioning to the next portion of the course, the class is divided into small groups, each consisting of 4–5 students from varied backgrounds to enhance students' interpersonal competence in integration with systems thinking and strategic competence as follows. The groups are tasked with highly ill-structured problem solving, requiring project teams to first choose and define, considering their values, a major urban challenge faced by a city of their selection. Over the years, students have selected a wide range of issues to explore and address, including air pollution, the prevalence of slums, homelessness, traffic congestion, social polarization, flood risks, urban heat islands, energy shortages, and unequal access to services and green spaces. With a reflective focus on their normative competence, systems thinking and spatial competence, each group examines their chosen problem in depth, defining the relevant variables and their functional relationships, setting problem solving goals and the means to pursue those goals considering how they could lead to co-benefits for other goals and concerns, such as climate change adaptation and mitigation, health, equity, resilience, and peace. This process is multi-faceted and involves several steps: identifying the various elements and subsystems of the urban system related to the problem, mapping the interconnections between these elements, and iteratively refining the map to maximize potential co-benefits and minimize trade-offs and conflicts in solving the problem. The mapping exercise is a critical component of the course and can be conducted using either traditional methods, such as posters on easels or drawings on the whiteboard, or through digital platforms like the Miro visual workspace. Through this exercise, each group develops a detailed graph network of problem nodes and links, which represents the complex web of interdependencies within the urban system. These networks illustrate the various positive and negative feedback loops, enhancing the students' understanding of the dynamic causality patterns that characterize urban problems in trying to solve them. The course culminates in a plenary session where groups present their problems, systemic maps and solutions to the class, providing an opportunity for peer feedback and further refinement of their task, hence enhancing their interpersonal competence, systems thinking, and strategic competence.

The course engages students in scenario-making exercises improving their awareness of the potential future impacts of climate change on urban environments and enabling them to develop comprehensive response measures to address these challenges. As the course progresses, it becomes evident that systems thinking about urban problems is not merely an isolated ability but one that is deeply intertwined with local knowledge, awareness of sustainability values, envisioning, and strategic competence.

4.2.3.2. Example: moderately ill-structured problem solving for real client. Politecnico di Torino launched in 2019 a problem-driven course for students enrolled in different master's degrees, that goes under the label *Challenge@Polito* (hereinafter Challenge). Politecnico di Torino offers two types of Challenges, both involving ill-structured problem solving although the first provides some problem premises reflecting a moderately ill-structured task. They involve: a) Challenge_By Companies, when the challenges come from companies and industries as real clients and b) Challenge_By Students, when the challenges concern macro themes selected by the university on topics considered strategic. The example below illustrates how a Challenge_By Companies, or moderately ill-structured problem solving for real client, fosters transformative learning of planning competencies for sustainable development.

Selected through an open call from all the Master of Science programmes offered at Politecnico di Torino, the students on the course are grouped into interdisciplinary teams composed of 5–6 units, characterised by a large heterogeneity in the educational background. The teams are required to develop common ground for the exchange of the different knowledge that they bring to the table, and to generate added value in this process, in so doing approaching the proposed challenge from an interdisciplinary standpoint and enhancing their normative and interpersonal competence.

The Langhe Monferrato Roero Tourism board initiated the Challenge *Enhanced Mobility for Sustainable Rural Tourism*, focusing on the Langhe Monferrato Roero region, a UNESCO Landscape Heritage site known for its unique vineyard scenery. Situated between the provinces of Alessandria, Asti, and Cuneo, this area encompasses 100 municipalities, each with an average population of a few hundred residents. Since being added to the UNESCO List, the region has seen a notable increase in visitors eager to explore Piedmont's rolling vineyard landscapes and its culinary and wine offerings. This surge in tourism has heightened awareness of the necessity for greater sustainability, specifically in developing wine tourism activities that align with the sustainable growth of the area. The reliance on private motor vehicles presents a challenge that must be balanced with tourists' mobility needs and the quality of their experience. Consequently, the Challenge sought to discover alternative and sustainable transportation solutions that allow visitors to enjoy the region and its attractions while ensuring its conservation and sustainable development.

The Challenge 'Enhanced Mobility for Sustainable Rural Tourism' had four main goals, set by the Langhe-Monferrato-Roero tourism board:

- "To develop a sustainable mobility model for tourists and visitors by fostering respectful, efficient and low carbon modes of transport.
- To tackle the externalities of tourism mobility practices and effects (frictions, seasonality, congestion, landscape, environmental issues etc.).
- To integrate sustainable mobility practices in the value-chain of tourism to promote green business opportunities.
- To enhance visitor experience without jeopardising the quality of life of the resident population".

During the whole semester, interdisciplinary teams of students worked on this challenge and developed their strategies to meet the above-mentioned goals. Despite the articulation of goals by the client posing a moderately ill-structured problem, students were tasked to actively explore the problem beyond the lens of the client and develop solutions through research, critical thinking, and iterative experimentation to address the goals. While providing the goal parameter by the client reduced the learning scope for envisioning competence in the problem solving task, it enhanced learning focus on interpersonal competence, systems thinking, and strategic competence as explained below.

During a two-days kick-off meeting, the challenge theme was introduced, and a number of specialised lectures on key aspects of sustainable rural tourism mobility were offered to the students, focusing on transport and accessibility planning in low-demand areas, the integration between spatial and landscape planning, tourism in UNESCO heritage areas, and the physical development of soft-mobility infrastructures. Then, for the remaining of the semester involving the problem solving task, the students' teams were supervised by two coordinators and six mentors with different expertise (landscape architecture, planning and project assessment, spatial planning and local development, transport planning, transport design, management and economics). Students were encouraged to study the spatial context from competing perspectives to reframe the problem with a systemic approach and craft strategic solutions which support the four integrative goals for sustainable transitions set by the client. Facilitated by their pursuit of common goals for the problem task, students were encouraged to share their reflections and critique each other not only within teams but also with other teams. In addition to their reflective teamwork, students were required to interact with one or more mentors at least once a week, and by means of this iterative, interactive process to refine their problem representations and proposals to tackle the challenge. With a focus on links between fostering interpersonal competence and strategic competence, three intermediate meetings were organised, at the presence of the whole teaching staff as well as of the staff of the Ente Turismo, where students illustrated their ideas and received feedback on how to improve their solutions, with this intersectoral feedback facilitated by common goals for the problem task. A final presentation of the teams' work, organised at the end of the semester and participated by various local stakeholders, closed the activity and provided final learning, particularly in terms of interpersonal competence and strategic competence.

5. Conclusions

Human settlements play a determinative role in sustainable development at both the local and planetary levels, but this role tends to emerge in more negative than positive terms, such as air pollution, sprawl, biodiversity loss, and unaffordable housing. Saving human settlements and our planet requires commitment and action for sustainable development at multiple levels, including the individual, professional, community, and political levels. Professional transformations are often most complex, involving conflicting interests and requiring much relearning of knowledge, skills, and values. Planning is a unique profession that aims to drive and integrate change across the different levels of action for sustainable settlements, but it first needs to ensure in-house transformation to accomplish this mission.

Understood as "a means by which society decides collectively what urban [and rural] change should be like and tries to achieve that vision by a mix of means." (Rydin, 2011, 12), there is broad consensus that planning should fully incorporate the notion of sustainable development (McDonald, 1996). Planners have a critical role to play in enabling whole society transitions and bringing together the local dots of sustainable development in a complex and uncertain process. While some planners spend much of their time fighting small but lengthy battles that have only marginal significance on the big picture of urban change, as Healey (1999) argues from an institutionalist perspective, planners might sometimes also play a role in reshaping the context in which they are operating. This is, however, not possible without transforming what planners learn and how they learn in preparing for their professional role as whole individuals.

This study is the first to identify planning competencies for sustainable development, also the first to identify types of transformative learning activities to support teaching for sustainable development. The study therefore makes original contributions to both planning and education literature, in addition to its interdisciplinary methodological contribution through an original design of 'framing and sensemaking + reframing' applied for knowledge recombination between two fields – i.e., sustainability competencies and planning competencies.

The study proposed that planning competencies for sustainable development consist of three areas, including (a) knowledge to understand human settlements, (b) skills to plan sustainable settlements, and (c) values to stand for sustainable communities. Knowledge to understand human settlements involves spatial competence, and systems thinking. Spatial competence is defined as the ability to survey and analyze human settlements from different aspects and enrich this ability in a domain of specialty, and systems thinking is the ability to analyze human settlements between different domains and levels, whereby considering multiple systemic interactions in identifying and approaching problems. Skills to plan sustainable settlements include envisioning competence, strategic competence, and interpersonal competence. Envisioning competence is defined as the ability to analyze and craft multiple spatial pictures of a more sustainable future. Strategic competence is the ability to design and drive interventions, urban transitions and spatial transformations. Interpersonal competence is the ability to motivate, enable, and facilitate the flow of ideas, information, and collaborative action. Finally, values to stand for sustainable communities translates to normative competence. Normative competence is defined as the ability to identify (with), negotiate, reconcile and apply stakeholder values for justice.

Following conceptual reflection on transformative pedagogy as an appropriate approach to teaching for sustainable development, the study identified three types of learning activities in transformative pedagogy, including (1) unlearning - relearning activities, (2) learning through new experiences, and (3) ill-structured problem solving. Original pedagogy examples of these activities from the UK, Belgium, Norway, Italy and Japan illustrated that teaching planning competencies for sustainable development is an integrated process, albeit with varying levels of focus in the three types of learning activities. For example, unlearning activities, such as the action research example in this study, might involve a focus on spatial competence, helping learners to identify, question and dismantle unjustified or unconscious beliefs about human settlements, seeking to relearn equitable, sustainable perspectives about communities. Unlearning activities might also focus on strategic competence, enabling students to challenge routine, trusted practices that do not support sustainable transitions, moving away from less effective accumulative learning to relearning of new interventions that support sustainable development. Learning through new experiences, like the examples of feel-trip and roleplay provided in this study, supports immersive adoption of planning competencies for sustainable development. Encounters with cultural or natural otherness (e.g., volunteer tourism, and fieldwork in nature as a sensuous realization) and activities involving less applied intelligences in learning (e.g., games) or interdisciplinary tasks, all followed by reflective assignments about the new experience challenge students to make sense of what they are experiencing, hence supporting transformative learning of competencies difficult to foster in familiar learning practices, such as normative competence and interpersonal competence. Ill-structured problem solving was shown in the two example discussed to support transformative learning of planning competencies for sustainable development. Overall, ill-structured problem solving fosters spatial competence and systems thinking in defining and representing the problem. It also enhances strategic competence, envisioning competence, and

interpersonal competence in team solving the problem, while fostering normative competence in justifying problem representations and solutions. Highly ill-structured problem solving, which involves uncertainty in goals or values in addition to uncertain knowledge (e.g., addressing poverty), further supports learning of normative competence and envisioning competence. Moderately ill-structured problem tasks, which involve certainty in goals but uncertainty in knowledge (e.g., tackling congestion), provide more focus on strategic competence and systems thinking to accomplish the goals and values set by the task.

The study findings have implications for stakeholders in planning education and profession, as well as researchers and higher education stakeholders in other disciplines. Professional bodies and regulatory stakeholders of planning are encouraged to explore the implications that the proposed competencies might have to further consolidate sustainability into professional development and assessment of planning graduates. Planning students might consider the proposed competencies to benchmark and demonstrate their learning in relation to sustainable development requirements. Planning schools are encouraged to explore how the proposed competencies might inform future redesigns of their learning outcomes to fully incorporate sustainable development. They might also want to explore and (further) apply variations under the three identified types of transformative learning activities to support 'sustainable' learning of planning for sustainable development. Higher education stakeholders in different disciplines might (further) examine and apply the transformative pedagogy approach analyzed in conceptual detail and synthesized in terms of its learning activities in this study. Researchers from other disciplines considering to explore competencies for sustainable development in their field might find the systematic methodology of interdisciplinary knowledge recombination designed in this study helpful to take advantage of the rich literature about competencies for sustainable development.

Future studies might further examine the planning competencies for sustainable development with an implementation lens to set learning priorities and ensure that the broad framework does not overburden planners. Another potential area for future research is the views that students, graduates, or employers of planners might have about the content and pedagogy of planning education. As most views analyzed in this study come from the literature and academics, this study flags the need to bring practitioners of planning more fully into debates about curriculum and pedagogy.

CRediT authorship contribution statement

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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