A Note on Urban Sustainability-Education Nexus

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Abstract: Urban sustainability informs and is enhanced by the pedagogic principles that have emerged with discussions of teaching and learning effectiveness of alternative educational models. Furthermore, the urban sustainability-education nexus suggests that reciprocity is beneficial, meaning the theory and practice of planning sustainable cities and regions is also enhanced by certain pedagogic procedural principles from classroom to community. However, these pedagogic principles are more than mere procedural abstractions if informed substantively by urban sustainability values. The nexus has implications for urban education with an emphasis on environmental sustainability and the practice of planning sustainable cities and regions**.**

 Keywords: urban sustainability, education models, urban education, environmental
 sustainability

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"Our educational systems are only beginning to make use of the local community and the region as a locus of exploratory activities: but before the resources and activities of a region are treated as abstract subjects they should be understood and felt and lived through as concrete experiences." *The Culture of Cities* (Mumford, 1938, p. 383)

1. Introduction

With the ever-increasing urbanization of world population demanding limited natural resources and contributing to climate change, cities and regions are viewed as logical loci for discussions of urban sustainability, envisioning quality of life for present and future generations. The emphasis on "actors"—individuals, organizations, and governments—in discussions of urban sustainability highlights the notion that collective action is a key to addressing challenging multifaceted issues and promising opportunities in the planning and design of sustainable cities and regions in the twenty-first century. Where better than in the region, as Mumford (1938) would say, to experientially explore the challenging issues of urban sustainability, participating actively in shaping the sustainable cities and regions of the future? (see also Fishman, 2000; Wheeler, 2000; Calthorpe & Fulton, 2001; Brown, 2011)

In this paper I argue that certain pedagogical principles are aligned with the values of urban sustainability, and identify those principles that urban sustainability values in theory and practice have in common. While the pedagogic principles are compelling tools for universal teaching and learning, they are more than mere procedural abstractions if substantively informed by urban sustainability values such as conservation, efficiency, and justice. Furthermore, the nexus suggests the benefit of reciprocity, meaning the practice of urban sustainability in planning sustainable cities and regions is also enhanced by certain pedagogic procedural principles from the classroom to the community.

It should be noted that the educational practices and principles identified are not held in every classroom, just as urban sustainability values are not identically held in every community across cities and regions. Circumstances and values are different in different cities and regions (see Lynch, 1981). However, the six principles outlined in the next section are better regarded as scalable "performance dimensions" (Lynch, 1981) that reflect the sustainability values and circumstances specific to a city and region. In the section that follows, these principles are identified from a vast education literature.

Discussions of the use of technology and social media tools as means to enhance learning in "classrooms" with timely feedback and engaged teaching protocols initially motivated the literature search method and the topic of this paper (see also thencat, 2005). It turns out that universal pedagogic principles are strikingly similar to emerging city- and region-planning and design paradigms, like those that value reflective, collaborative, and communicative action (e.g., Forester, 1999; Innes, 1996 and 1998). Logically, we also included in our search of a vast education literature a subset that contained "sustainability" as a subject-matter (e.g., Pepper and Wildy, 2008; Svanstršm et al., 2008; Sibbel, 2009). Notwithstanding a focus on sustainability, this literature lacks a nexus with the city and the region in substance or procedure, which is a methodological focus of this paper. The literature search was not just limited to education for sustainable environments. Effective pedagogic models with features that directly correspond with emerging principles of urban sustainability are identified. Furthermore, abstract pedagogic principles are given concrete expressions with sustainability values embedded in the planning and design of sustainable cities and regions, which are discussed in section 3. The paper concludes with a discussion of the urban sustainability-pedagogy nexus' implication. We begin with a brief review of effective pedagogic principles in the classroom before we consider the implications for the community.

2. Emerging models of effective education

A brief recap of emerging pedagogic models in a vast literature reflects experiences in mainly higher education (e.g., Nicol & Macfarlane-Dick, 2006; Boud & Falchikov, 2006; Svanstršm et al., 2008). The areas of focus in models of effective education are varied. An exhaustive review of all models is not attempted here. However, the following pedagogic features are common to these models: critical thinking; holistic or systemic thinking; long-term orientation; engaged, participative learning (in contrast to passive or spectator sports-like behavior); collaborative learning; timely feedback; and learning in cyberspace-as-classroom. Each of the six pedagogic features is outlined with a brief description. We will then briefly note urban sustainability values with commonalities to pedagogic principles in education literature.

2.1 *Thinking Holistically*

Shea (1998) makes the flowing observation:

"The image of the classroom as a living ecological web of relationships is a favorite metaphor used to describe the structure and functioning of the American public schools. This metaphor is grounded in the image of caring, sharing, and of mutual coexistence; the implication here is that since we are all connected, we should act cooperatively to maintain and preserve our collective work environments. Here, one sees oneself and others as part of a collective whole, an organic 'Gaia,' a universal classroom, a part of an interconnected biologically based web of community alliances and obligations. At its core, then, the living ecological web metaphor resonates with a concern for the delicacy of the strands that connect us and provide us with sustenance—it dramatically captures the theme that we affect everything and everything affects us." (pp. 349-350)

Holistic approaches to education stress the kind of learning that occurs when we think about the interconnections. Understanding the "bigger picture" is accomplished by understanding the logic of the whole system's links (Ackoff, 1979). The logic of the links is featured both analytically and holistically with holistic approaches evident in both "basic" theoretical and "applied" professional disciplines (see also Simon, 1981). The whole-part connection is emphasized in

sciences and professional fields—the universe (cosmos) and matter (particles) in physics; community and individual in social science; nature and nurture in natural science. In medicine, the holistic paradigm calls for treatment of the whole person—body and mind, the individual and the environment. The web of knowledge is increasingly forging connections, combining separate disciplines with hyphenated labels—astrophysics, biochemistry, environmental psychology, and the like.

Pedagogic models that emphasize instructions that foster holistic thinking appear in a wide variety of urban-planning and design-related fields. Ackoff (1979) argued that analytical methods encounter limitations in dealing with interconnected—"messy"—managerial and design problems, particularly in a turbulent, uncertain environment that characterizes urban sustainability. Others have labeled them as "wicked" problems, and the search for optimal solutions to them is considered to be in vain (Weber & Rittle, 1973). Rather than analytic methods that take the parts apart, to paraphrase Ackoff (1979), "systemic thinking in a changing environment helps with holistic skills that planners, designers, and managers use to devise means to "invent" and to bring about a desirable future. This kind of systemic thinking is particularly in synch with unified ecologic, social, economic, and physical world views of planning and design toward creating a sustainable urban future (Calthorpe & Faulton, 2001).

2.2 *Critical Thinking, Reflective Practice*

 Modern sciences, particularly economics and psychology, have highlighted that peoples' capacity to process information is bounded, and that people rarely have complete information on which to base optimal decisions. The seemingly "optimized" decisions are actually "satisfied"—or good-enough—choices made in the face of incomplete information in the decision-making environment (Miller, 1956; Simon, 1981 and 1983).

People may not have complete information, but they do possess a natural ability to think logically and to make discerning judgments. From ancient to modern times, philosophers, logicians, and scientists have been contributing to the development of critical thinking, a

particular mode of thought process in problem-framing and problem-solving. For example, Marx was thinking critically in writing about the crises of capitalist markets, revealing structural problems—like the tendency of declining profit—and characterizing economist colleagues as prisoners of their own categories, successful in interpreting the world, but unable to change it [paraphrasing David Harvey—a critical thinker-geographer extraordinaire, for example see Harvey (1973, 2006)]. Oxygen's discovery within the field of chemistry represents another example of challenging existing categories and theories.. As Harvey (1973) recounted, Lavoisier is considered the real discoverer of oxygen with his critique and rejection of phlogiston theory, rather than Priestly who had called it dephlogisticated air (paraphrasing again). The critique and falsification of exiting concepts, theories, practices, or paradigms is part and parcel of doing science, with scientific revolutions bringing new formulations, as Kuhn (1970) described. The elements of critical thinking are summarized thus:

"[R]easoning occurs within points of view and frames of reference…evaluate clarity, accuracy, relevance, depth, breadth, and logicalness; reasoning proceeds from some goals and objectives, has an informational base [data]; data must be interpreted; interpretation involves concepts; concepts entail assumptions; basic inferences in thought have implications." (aboutCT, 2009)

2.3 *Long-Term Orientation*

Pepper and Wildy (2008, p. 613) interviewed public (western Australian government) secondary school teachers "leading the education for sustainability." Their conclusion: Leadership for sustainability "requires a combination of a deep knowledge of sustainability; forward thinking and the ability to imagine a different future; the interpersonal and networking skills to build strong relationships; and the energy and capability of taking action to achieve the imagined different future." These features are in contradistinction with educational practices that are fragmented, capricious, or unpredictable, and lack vision, collegial alliance, and collaboration. It turns out that these very features correspond to the values that are manifested in urban-sustainability concepts and practices (section 2).

2.4 *Communication and Collaboration*

By arguing that it is beneficial to collaborate when learning challenging subject-matter, Feltovich et al. (1996) confirm the popular adage that two heads are better than one! The "multifaceted relationship between desirable individual and group cognition" is asserted thus. In particularly complex, ill-defined knowledge-application domains, the effective features of team learning and collaboration are individuals finding "points of intersection with diverse others in their collaborations, [so that] the groups they are a part of are more likely to maintain a healthy diversity, avoiding an undesirable group assimilation of different individuals' contributions toward some oversimplified and ineffectual common denominator" (Feltovich et al., 1996). Multiplicity—diversity of perspectives—openness, and flexibility are desirable pedagogies. However, they also stress the importance of "nurturing" team-learning features in individuals in "learning situations" (Feltovich et al., 1996, p. 25). See also Friend and Cooke (1992). For a discussion of the pedagogic paradigm shift in distance education to a "learner-centered" environment and the technologies that foster collaboration, see Beldarrain (2006).

Bruce and Easley (2000) argue that a broadly conceived community e.g., a community of neighbors, scholars, learners, students, practitioners, or a community distinguished by diverse entities, e.g., local or global communities, is sustained by communication. Lynch (1981) remarked "communication is one fundamental reason for being of any human settlement" and defined the city as a "communication network" (Lynch 1981, p. 336). Global climate change and infectious-disease epidemics are prime examples of reasons for the international scientific community to communicate and collaborate (RAND, 2001). Environment issues, however, are only broadly labeled by the crises of climate change. Employment security, poverty, world hunger, social and regional inequality, affordable shelter and health care, renewable and nonrenewable energy, and the like are issues with a global reach (see also Brown 2011). These issues are interconnected and exceed the capacity of any one community to address (see also Sibbel, 2009). They require the communication and collaboration of multiple communities of

interest—scientists, governments, and citizens of the globe—with similar virtuous features of effective team building in the classroom, coping with challenging, complex, multifaceted problems!

2.5 *Feedback*

 Boud and Falchikov (2006) argue the case for an educational model of assessment (feedback) for lifetime learning in practice (work and life)—not just those that are limited to the assessment of the learning experiences in the academy. The notion of "sustainable assessment" is interesting. Sustainable assessment "meets the needs of the present without compromising the ability of students to meet their own future learning needs." (Boud, 2000, p. 151) Self-assessment and reflective practice in context are those very features that characterize urban planners and designers learning in professional practice (Schön, 1983 and 1987).

Active engagement and immediate and effective feedback are among "best-practice" principles in instructional design (thencat, 2005). Instructional technologies that aid in timely feedback with instructor-student communication or group discussion further these principles. Increasingly, the technologies are Web-based, used in the virtual classroom or the community. They are used in education, business and industry, and government with so-called webinars, podcasts, and the like that facilitate sustained communication and collaboration in the "network" society (see also Castells, 2000 and 2009).

2.6 *Learning in Cyberspace*

The motivation for sustained learning beyond initial schooling is individual and social, and lifetime learning occurs through communication in different arenas. The purposes for communication in cyberspace—distance-learning—are as varied as their users—schools, governments, non-governmental organizations (NGOs), companies, businesses, and individuals

in both developed and developing counties (Potashnik & Capper, 1998). For educational institutions, the motivation is to cater to a population with jobs that limit physical presence on campus, and to deliver cost-effective education that results in increased enrollment. For businesses and companies, the reasons for continuous learning/training are survival and further growth in a complex, competitive, and dynamic environment. For governments, it is an obligation to train teachers for public education or workers for the private industry and to serve the population in isolated communities and regions that are neglected by markets. For individuals, it is self-motivation arguably induced by the constraints and opportunities in the environment, broadly conceived, for personal lifetime learning and growth (for discussion, see Potashnik & Capper, 1998).

Just as money and credit circulate global markets, advances in technology are breaking down the barriers of distance in the global reach of education and training. Interestingly, similar local-global tensions arise in educational markets and capital markets! What is more important, though, is that the schools, governments, NGOs, companies, businesses, and individuals that participate in distance learning are the very parties whose collective actions are considered instrumental in the stewardship of a sustainable environment. It follows, then, that Web-based telecommunications, as well as the wide venues of the communication media, electronic books, documentaries, video (conferencing), TV, and (interactive) radio that are used in distance learning, also provide public-education venues by drawing attention to challenges and opportunities of a locally and globally sustainable environment (see also Wiland & Bell, 2008).

We now turn to a brief discussion of urban sustainability, in principle and practice, in relation to the effective instructional models. The common features are identified, as are the conflicts and implications of strategies for narrowing the chasm in practice and education for urban sustainability.

3. Emerging Theories and Practices of Urban Sustainability

The six above-highlighted pedagogic principles that enhance teaching and learning effectiveness are identified in a vast education literature. However, it turns out they correspond with values of urban sustainability. The parallels are indicated in Table 1. The common features are holistic, systems thinking; critical thinking and reflective practice; long-term learning; communication and collaboration; feedback; and learning in cyberspace. For example, holistic, systems thinking, emphasized as a desirable educational principle, has parallels with the view of ecology as a unified whole. Long-term (learning) is a feature in common with views of urban sustainability adopted in comprehensive metropolitan regional plans. Portland, OR; Seattle, WA; Salt Lake City, UT; and Vancouver, BC are among examples of Regional Cities with long-term plans that emphasize sustainable urban growth and development (for in-depth views of the plans and principles of urban sustainability, see Calthorpe & Fulton, 2001 and Wheeler, 2000; 2002; and 2008). Portland's long-term comprehensive plan time-horizon is the year 2040. Planning for Seattle as a sustainable Regional City with Vision 2020 was set into motion in the 1980s (Calthorpe & Fulton, 2001, p. 161). To appreciate the education of urban sustainability, we quote Calthorpe and Fulton (2001) at length, describing the planning process in Salt Lake thus:

"In a large conference room in downtown Salt Lake City…civic leaders gather to begin the process of envisioning the future of their fast-growing region. The 150 participants sit at small tables in groups of 10, armed with detailed maps of the region and seventy 'chips'—small squares of paper, each representing four square miles of typical suburban growth. Their assignment: to accommodate the next million people in Salt Lake City by finding the best way to arrange the chips on the map…The participants…soon realize that if the Salt Lake region continues to grow at the current densities, much of what they love about the Wasatch Front will be destroyed. So each group takes a different approach. Instead of spreading the chips out, the participants begin stacking them, one on top of the other—indicating that they are willing to accept higher densities in order to preserve agriculture and pristine land. When that isn't enough, they begin laying the chips on top

of existing urban areas—in places that they know are underbuilt or in need of renewal. By the time they are done, they recognize that a different vision of their future is necessary and possible." (p. 1)

Planning for a sustainable Regional City thus reflects the pedagogic principles that emphasize thinking holistically (urban *and* suburban, built *and* natural environment), critically (unsustainability of urban sprawl), reflectively (situational learning and decision-making), communicatively, and collaboratively (group deliberation). As Fishman (2000) chronicles, "regional conversation" is among the planning lessons learned from the 1960s. Wiland and Bell (2008) argue the case for the use of documentary film and media, including the Internet, as a "communication strategy" toward environmental sustainability. The documentary *Edens Lost & Found* addresses wide-ranging topics regarding sustainable environments, including watershed management, green buildings, public transit, walkable communities, and environmental justice and stewardship. Furthermore, the contents of a high school curriculum that uses *Edens Lost & Found* are similarly characterized with a wide range of environmental sustainability issues. Rather than in the abstract, the pedagogic principles noted above are effectively presented in the classroom with urban-sustainability issues thought of in concrete situations—e.g., a green building that uses renewable resources for heating and cooling, a pedestrian-friendly street, a neighborhood with convenient access to a reliable public transit. In other words, pedagogic principles—compelling tools for learning and teaching about urban sustainability in the classroom—are more than mere procedural abstractions if informed substantively by urban-sustainability values.

Urban sustainability calls for stewardship (for a discussion of urban ecological stewardship with a watershed restoration project, see Platt et al., 2008). Brown (2008) discusses the use of the Internet to communicate citizen feedback. Brown (2008, p. 165) cites a project, "D-Tower," (Spuybroek, 2002) "a roughly 40-foot sculptural structure that changes color based on the emotional state of a Rotterdam community of approximately 45,000 people, as evidenced by

their responses to a monthly questionnaire administered over the internet." Brown (2008) concludes:

"If a neighborhood beacon reported environmental data like conservation and waste, how many citizens might be motivated to take action to turn it from red to green? While this is an extreme proposal, clearly the Internet and its associated communications technologies offer many new avenues for citizen participation, feedback, and behavior modification—as yet unexplored." (p. 165)

Table 1. Comparative pedagogic and urban sustainability principles and values.

Pedagogic Principles	Urban Sustainability Values
Holistic, systems thinking	Ecology is a unified system; nature and the built environment are integrated, nested systems locally and globally.
Critical thinking, reflective practice	Critical assessment and reflection of daily life and work results in changed individual and collective attitude and behaviors toward increased levels of sustainability.
Long-term learning orientation	Sustained assessment ensures that present life style does not disrupt ecologic balance or deprive future generation's access to natural and built-environment resources.
Communication and Collaboration	Sustainable communities are outcomes of active participation, communication, and collaboration of citizens, governments, businesses as engaged actors in neighborhood, city, region, and the world.
Feedback	Sustained monitoring and continuous learning of a dynamic environment—both natural and human-made—is a fundamental component of stewardship.
Learning in Cyber-space	Telecommunications technologies are modes of communication and dissemination of information about challenges, prospects and values of environmental sustainability locally and globally.

Sibbel (2009, p. 79) argues the case for environmental sustainability with a greater emphasis on the actions and expertise of professionals—in government, industry, and communities—rather than on mere behaviors and choices of consumers (individuals/households). Consumers arguably have limited knowledge or capacity to process information, or to make informed decisions while keeping in mind the actions' environmental consequences. In contrast, professionals, if introduced to a multidisciplinary curriculum in higher education, have the opportunity to build the capacity for "balancing all the social, environmental and economic costs and benefits," recognizing values of "self-efficacy," and thereby determining the priorities of actions. The education for urban sustainability, however, adds a physical or spatial element to the professional-capacity building, while balancing the benefits and costs.

The multifaceted problem of urban sustainability is addressed in the Regional City (Calthorpe & Fulton, 2001). The Regional City world view is simultaneously ecological, social, and physical—dealing with land use, transportation, the environment, housing, tax equity, and education. The Regional City's neighborhoods are diverse in population, land-use, and housing types. The neighborhoods are walkable. The urban centers are hierarchically differentiated and thus varied in size and mixed in land-use and density. The corridors that link neighborhoods and urban centers provide regional mobility options with accessibility to jobs and opportunities. The metropolitan region's natural environment is conserved in zones designated "preserves."

The Regional City features durable design concepts and principles holistically, from the design and orientation of buildings that optimize energy efficiency to the regional location of towns that preserve natural open space or contain urban sprawl. In this way, it is similar to the garden city concept (Howard 1898/1902) with its layout of multiple urban centers linked with transit and highway corridors in a metropolitan region (e.g., 2040 Metro Framework Plan of Portland). In sum, the Regional City "building blocks" are commensurate with its varied scale—from the metropolis-wide region and its global reach down to the level of the buildings and sites in

neighborhoods. Synthesized from otherwise vast but scattered planning and design literature, the building blocks offer perspectives on urban sustainability concepts and indicators systematically akin to holistic, nested notions of regionalism (Wheeler, 2002).

4. Urban Sustainability-Pedagogy Nexus: Conclusion

The six educational principles—holistic, systems thinking; critical thinking and reflective practice; long-term learning; communication and collaboration; feedback; and learning in cyberspace—correspond to the principles, values, and practices of urban sustainability. However, they vary in relative importance in the practice and education of urban sustainability, and are contradicted in certain planning and design paradigms. For example, long-term (learning) orientation is a feature of comprehensive metropolitan planning (feedback and review in plan implementation), but not of the incremental, short-term project planning. The proponents of incrementalism plausibly argue that learning occurs with each incremental step, however disjointed. Holistic or systems thinking is a hallmark of urban planning and design in practice and education. The urban-sustainability emphasis in a long-term comprehensive plan draws on integrated views of urban development in balance with conservation of natural resources akin to holistic principles of ecology. Feedback is a feature of planning paradigms, though it is also varied in relative importance in synoptic, incremental, transactive, radical, mixed-scanning, reflective, interactive, strategic, communicative, and the like (see Hudson, 1979; Banai, 1988; Innes, 1996; 1998; Forester, 1999). However, feedback is the kernel of Brooks's (2002) experimental "trial ballooning" planning strategy. The idea is to jump-start planning process with concrete situational alternatives—instead of abstract goals—to solicit public and political attention. Finally, cyberspace has widened the local and global reach of the media stewards, advocates, leaders, and managers of common goods—watersheds, open spaces, public infrastructure—which characterize the natural and human-made environment with dissemination of information, public education, communication, and collaborative action, just as in the classroom (see also Ostrom, 2000; Wiland & Bell, 2008).

If, as some have argued, the classroom is a community like the neighborhood, the city, or the region—diverse in populations, purposeful in intentions, seeking ideals, and anticipating desired outcome(s), then pedagogically effective models provide perspectives relevant to the principles, practices, and education of planning and design in bringing about a sustainable urban future. It turns out that certain pedagogic principles have synergies with substantive goals of urban sustainability. Holistic, systems thinking; critical thinking and reflective practice; long-term learning; communication and collaboration; feedback; and learning in cyberspace represent a synthesis of pedagogic principles and skills identified in higher-education research, with implications for planners, citizens, and leaders to engage effectively in planning sustainable cities and regions. By exercising these skills, the practitioner takes cognizance of the strength and liabilities of the theories and practices of planning the sustainable cities and regions of the future. The theories of planning practice, however, are distinguished by varied emphases placed on knowledge and skill areas, and are even contradicted in certain planning and design paradigms as noted above. In combination, the pedagogic principles are effectively considered meta-criteria with which urban sustainability is plausibly informed and calibrated systematically in concrete practical situations. However conversely, the specificities of urban sustainability—as in unified ecologic, social, economic, and physical world-views of the Regional City—supply the substance with which pedagogic procedure in urban environmental education is gauged.

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