**Improving Sustainability Education Policy through Research Partnerships:
Reflections and Analysis from New York City**

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Abstract
This paper examines an ongoing research partnership between the New York City Department of Education Office of Sustainability and Teachers College, Columbia University. Similar to other global cities like London and Hong Kong, New York City recently initiated a groundbreaking effort to address the long-term challenges the city faces relating to climate change and sustainability. Now in its fifth year, the research partnership strives to improve school engagement with sustainability through the development of research-based knowledge and evidence. This paper examines the partnership's outcomes and assesses the ways in which policymakers use these results to inform policy and practice. Two lines of educational research—the application of improvement science and research use—are utilized to contextualize this work, which concludes with lessons learned and suggestions for potential future research.

Introduction

In general, the field of educational policy and politics offers useful theoretical frameworks and methodological approaches for analyzing the emergence, development, and implementation of policies (Cooper, Cibulka, and Fusarelli, 2008; Sykes, Schneider, and Plank, 2012). Educational policy scholars, however, tend to focus on policies related to issues of access, quality, and finance—with little attention paid to the field of environmental and sustainability education (ESE). Accordingly, this paper seeks to bridge the broader field of educational policy and politics with the growing literature on ESE policy research.

Policy research interest in the field of ESE has progressed over the past two decades (Aikensa, McKenzie, and Vaughterc, 2016), with scholars increasingly calling to strengthen this important line of research (Læssøe, Feinstein, and Blum 2013; Robottom and Stevenson 2013). Yet a systematic review of existing literature reveals several key limitations, such as under-representation of the Global South and reliance on descriptive and non-empirical approaches (Aikensa et. al., 2016). This review also suggests the environmental degradation and international policy discourses that drive local policy/practice (Bromley, Meyer, and Ramirez, 2011; Pizmony-Levy, 2011) drive the expansion of policy research. To bridge the gap between ESE and traditional educational policy and politics, this paper explores the relationship between research and policy by analyzing and contextualizing the authors' experience establishing a research partnership between the Office of Sustainability at the New York City Department of Education (DOE) and Teachers College, Columbia University (TC).

University-community research partnerships are formal arrangements linking knowledge production and policy/practice (Nelson, London, and Strobel, 2015). In contrast to traditional models of public engagement, in which researchers translate and share their work with broader

communities, research partnerships are collaborative exchanges that mutually benefit researchers/universities and communities (Boyer, 1990; 1996; Carnegie Foundation, 2006). As such, they are considered a promising strategy for better aligning the research and development community with the policy/practice community.

The DOE-TC partnership brings together teams from both organizations to conduct research in an effort to better understand the role of schools in supporting New York City's sustainability goals. The teams work together on designing instruments to collect data from city schools, such as the School Sustainability Plan and the Annual Sustainability Survey. The TC team standardizes school-level responses across sources and over time to create longitudinal data on ESE engagement. The team also links school-level responses with other datasets provided by the city to further enrich the analysis. Working together, the two teams identify research questions to guide this inquiry. The TC team then conducts data analysis and supports the DOE team in understanding research findings and implications. This collaborative process enables the DOE to make data-driven policy and programmatic decisions with regards to its sustainability efforts. When questions arise that are beyond the scope of the quantitative data, both teams conduct supplemental qualitative research using interviews, focus groups, observations, and document analysis.

This paper's objectives are to: (1) describe the DOE-TC research partnership, and (2) situate this work within the theoretical framework of research use and improvement science. Data sources include meeting minutes, presentations, papers, and e-mail exchanges between the DOE and TC teams, as well as reflections and observations drawn from the first three years of the partnership. The first section of the paper presents a literature review detailing the primary two lines of inquiry that informed the research partnership. In the following section, the

background of the partnership is presented as regards the policy context in New York City and the specific needs of the DOE and TC teams. The next section describes and analyzes the research partnership itself, including process and outcome examples. The paper then concludes with key takeaways and an examination of potential future scholarship on research-policy partnerships in the field of ESE.

Literature Review

Existing scholarship offers insight into the relationship between research and policy in ESE. Of note, the DOE-TC research partnership draws from two areas of inquiry in particular: (1) the application of improvement science in education (Bryk, Gomez, Grunow and LeMahieu, 2015; Langley et al., 2009; Lewis, 2015), and (2) research use studies (Davies and Nutley, 2008; DuMont, 2015).

<u>Application of Improvement Science in Education</u>

Although research and evidence-based interventions are abundant in the field of education, policymakers and scholars are increasingly worried about the ability of this wisdom/expertise to spur broad-scale improvements in schools (Bryk, Gomez, and Grunow, 2011). Improvement science seeks to address this problem by developing the necessary *know-how* to allow reform ideas to spread faster and more effectively (Langley et al., 2009). While the ideas underlying improvement science are not new to education researchers (e.g., action research and formative evaluation), this framework can nonetheless contribute new tools, processes, and approaches that have proven useful outside the realm of education (Lewis, 2015).

Scholars writing within this framework theorize that two types of knowledge are needed in the pursuit of educational improvement (Langley et al., 2009; Lewis, 2015). The first type is basic knowledge from the field of education, such as effective ways to teach sustainability concepts or effective strategies to encourage schools to address sustainability goals. The second type is multi-disciplinary knowledge regarding *how* to implement that basic knowledge within organizations. This type of knowledge is drawn from sociology, psychology, and statistics, and includes an understanding of complex systems, variations, and ways of knowing.

Improvement science relies on "rapid tests of change to guide the development, revision and continued fine-tuning of new tools, processes, work roles and relationships" (Carnegie Foundation for the Advancement of Teaching, n.d., para. 1). These rapid tests are also known as Plan-Do-Study-Act cycles. In their book, *Learning to improve: How America's schools can get better at getting better*, Bryk and his associates (2015) point to six core principles of improvement (see Figure 1, below). These principles offer both guidance and aspirational targets for continuous improvement processes.

Figure 1 – about here

Improvement science literature is particularly useful here because it offers a profound shift in the traditional roles of researchers and practitioners (Bryk, Gomez, and Grunow, 2011). A common division of labor sees researchers perform the intellectual work at the front end of an idea pipeline, with practitioners subsequently implementing and adapting the researchers' efforts. This approach, however, overlooks practitioners' vital firsthand knowledge and experience with local problem-solving. By contrast, improvement science argues that complex problems demand collaboration between different stakeholders, including researchers, policymakers, and

practitioners. This collaborative effort brings together different perspectives and skills, while simultaneously fostering necessary buy-in from key stakeholders.

Research Use Studies

Although high-quality research has the potential to improve policy and practice, it often does not. Research use studies therefore strive to better understand when, how, and under what conditions research-based knowledge impacts policy and practice (Davies & Nutley, 2008). This field of study, therefore, informs the work of the DOE-TC research partnership and assists in the analysis of the partnership's outcomes by providing a framework to understand how and why policy makers and practitioners use research.

Classic typologies from literature are used for further specification of research utilization categories (Davies & Nutley, 2008; Lavis, Robertson, Woodside, McLeod & Abelson, 2003; Weiss, 1979). *Instrumental* use occurs when research is utilized to address a particular problem. *Conceptual* use concerns the influence of research on the way actors think about issues and frame problems and solutions. *Strategic and Tactical* use involves employing research evidence to support or challenge a particular action, such as a program or reform effort. *Symbolic* use occurs when research evidence is used to legitimate or sustain a predetermined position. *Imposed* use requires the use of research evidence, through legislative or other official mandates.

Past research in this field draws on diverse methodologies, including qualitative, quantitative, and social network analysis. Notably, research use is influenced by norms and values. When organizations value research, individuals within the organizations are more likely to use it in their work (Fitzsimmons & Cooper, 2012; Spillane and Miele, 2007). In turn, a key finding across studies of different systems and levels of policy suggests that relationships

between researchers and stakeholders matter (DuMont, 2015; Finnigan, Daly & Che, 2013; Goertz, Barnes & Massell, 2013). This indeed proved to be the case in in the DOE-TC research partnership. An important driver of research use is the ability of organizations and individuals to "localize" knowledge (Honig & Coburn, 2008; Nelson, et. al., 2009), which also proved true in the partnership.

Research Partnership Background

NYC Sustainability Policy Context

Similar to other major cities around the world, New York City has initiated several efforts to address the long-term challenges the city faces relating to climate change and sustainability (C40 Cities Climate Leadership Group, 2019). In 2007, Mayor Michael Bloomberg announced a strategic plan titled PlaNYC: A Greener, Greater New York (City of New York, 2007). The comprehensive plan, which was updated in 2011, sought to bring together 25 city agencies (including the DOE) in an effort to accommodate the additional one million people projected to live in the city by 2030, combat climate change, and enhance the quality of life for all residents. The plan set forth ten aspirational goals, including the diversion of 75% of solid waste from landfills and a 30% reduction in greenhouse gas emissions by 2030. Although analysts have pointed out certain weaknesses in the plan, the overall assessment of PlaNYC's progress has been positive (Cohen, 2012; Jabareen, 2014).

In 2015, Mayor Bill de Blasio launched a new strategic plan titled *One New York: The Plan for a Strong and Just City* (OneNYC; City of New York, 2015). This plan presented a vision for the city's fifth century organized around principles of growth, equity, sustainability,

and resiliency. Published just a few months before the United Nations adopted the 2030 Agenda

for Sustainable Development, OneNYC shares many similarities with the U.N.'s Sustainability

Development Goals, including initiatives and indicators that address the social, economic, and

environmental pillars of sustainability.

New York City has the largest school system in the United States. More than 1.1 million

students and over 1,850 schools fall within the DOE's jurisdiction—meaning the agency's

actions significantly impact the city's ecological footprint. Given this, and the fact that schools

have the potential to serve as meaningful change agents within their communities, both PlaNYC

and OneNYC addressed the city's education system as part of their sustainability efforts.

Published in 2009, Chancellor's Regulation A-850 established the DOE Office of

Sustainability to address city priorities, create an overall vision, and set goals for sustainability

initiatives at the DOE. Positioned within the DOE's Division of School Facilities and given

overarching waste and emissions goals to oversee, the Office of Sustainability initially

approached sustainability from a purely facilities-based standpoint. Over time, however, the

Office's approach evolved beyond facilities to engage directly with faculty and students in an

attempt to meet city sustainability goals. This type of involvement further embedded

sustainability as part of every school's culture and climate.

Early on, the primary purpose of the Office of Sustainability was to ensure compliance

with NYC Local Law 41—a recycling mandate requiring every public and private school in the

city to designate a school-based Recycling Coordinator, create an annual recycling plan, and

complete an end-of-year survey. In conjunction with Local Law 41, Chancellor's Regulation A-

850 defined the role of "Recycling Coordinator" and required the position be filled by a member

of a school's staff. In light of complex city budgeting and limited resources, the Recycling

Coordinator position was established as an add-on position for current fulltime employees without compensation.

Following changes in the city's sustainability plans, Chancellor's Regulation A-850 was expanded to address sustainability in 2013, emphasizing "the importance of sustainability, to create a culture that accepts fiscal responsibility for sustainability goals, to enhance building performance, and to foster a sense of citizenship […] encouraging students to focus on sustainability" (City of New York, 2013: 1). Under the updated regulation, the title of Recycling Coordinator was changed to Sustainability Coordinator. The revised regulation clarified the responsibility of key staff in implementing school sustainability programs, mandated new timelines for reporting progress, and required schools to complete and submit an extensive school sustainability plan and annual sustainability survey. Both the plan and survey require schools to engage deeply with waste prevention, energy conservation, and curriculum and co-curricular activities.

As the city's policies and regulations for school sustainability have evolved, so has the Office of Sustainability. Figure 2, below, illustrates the Office's development over the past decade in four key areas: (1) office size, (2) number of external partners, (3) number of training sessions, and (4) number of participants in training (e.g., non-governmental organizations and higher education institutions).[1]

<u>Figure 2 – about here</u>

All four areas show growth over the past decade, with a particularly notable increase in office size. The Office of Sustainability formed in 2009 with just a single employee, but is now a

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[1] Data for this figure come primarily from Office of Sustainability Annual Reports and administrative files.

team of 18 full-time employees. This growth was necessary to help implement city sustainability goals and oversee priorities from the Mayor and the DOE's Chancellor.

Today, the Office of Sustainability has dedicated Energy and Zero Waste Teams to provide customized educational and operational support to match facility needs and school stakeholder interests. The ability to provide meaningful support to schools has helped the Office respond to city mandates and produce increased compliance and participation. For example, in AY 2016/2017, the Office created the NYC Solar Schools Program to manage the installation of solar photovoltaic arrays and create an educational program to connect rooftop solar to curriculum. As of February 2019, over 100 projects were in progress under the program. In this and other ways, the Office of Sustainability is able to build upon its facilities foundation to create not only technical resources, but also educational opportunities. Linking technical programs to classroom teaching and learning to foster an engaged population is integral to the mission of the Office of Sustainability.

Despite these advances, Chancellor's Regulation A-850 could be critiqued as weak from a policy studies perspective. First, scholars of educational change have argued that successful education reforms are those that make teaching and learning the heart of the matter (Fullan, 2016), yet the Office of Sustainability is located outside the academic core of the DOE. Second, effective educational policy configurations typically include well-defined standards and standardized assessments, but Chancellor's Regulation A-850 is vague and does not include clear definitions of key terms (e.g., sustainability) or measures of accountability. Third, as mentioned above, the Sustainability Coordinator position is unpaid and added-on to a full-time employee's other duties—rendering much of the policy's success dependent on varying degrees of individual availability and motivation.

Findings from the research partnership, however, suggest that the very *strength* of

Chancellor's Regulation A-850 can in fact be found in these perceived "weaknesses." Most K-12

school systems in the United States do not have any sustainability policy at all. And though the

Office of Sustainability is located within an educational institution, it is not solely guided by

traditional educational policies due to the city's overarching sustainability goals.[2] In turn, being

outside the teaching and learning core enables the Office to better respond to unique needs and

challenges of schools as they emerge through activation of sustainability programming. For

example, many barriers to participation stem from building logistics or operational limitations—

not academics. The flexible policy of Chancellor's Regulation A-850 allows the Office of

Sustainability to explore various strategies for engaging schools in the broad and dynamic topic

of sustainability. In addition, the current configuration of the Sustainability Coordinator position

taps in to educators' professional ethos of serving the public good. This ethos, combined with the

global/local discourse surrounding the urgent need to address sustainability challenges and

educate the next generation, can motivate educators by highlighting the Coordinator position's

larger purpose (Carton, 2017; Quinn and Thakor, 2018).

Partner Needs

DOE Office of Sustainability. Consideration of the DOE's needs has been—and continues

to be—a central component of the DOE-TC research partnership. The DOE's Office of

Sustainability was created, in part, to administer the Sustainability Plan and the Annual

Sustainability Survey. Yet early on, the Office lacked sufficient capacity to utilize these

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[2] Furthermore, the organizational location of the Office of Sustainability protects its work from the ebb and flow of teaching and learning policies, an area that is more likely to be affected by Global Educational Reform Movements such as test-based accountability and student-centered pedagogy (Sahlberg, 2016).

instruments and the data they collected in a meaningful, strategic manner. The Office therefore needed to develop its research capacity and data infrastructure to better inform its policy and programming activities. The Office also sought to increase connectivity between governmental agencies and community-based organizations in an effort to enhance teaching and learning in the field of ESE. The partnership with TC helps the DOE meet both of these needs by building out its research/analysis capabilities and while also helping to legitimize the DOE's efforts with educators and supporting programs.

Teachers College, Columbia University. As an institution of higher education, it is important for TC to offer its students real-world learning opportunities (Mooney and Edwards 2001). TC professors often address this need by inviting guest speakers, facilitating class-based projects, supervising internships, or collaborating with local agencies and organizations (such as the DOE). Notably, TC also has additional sustainability-specific needs due to the establishment of a schoolwide Working Group on ESE in 2014. The Working Group brings together faculty and students from across departments and programs to collaborate on ways to better engage with ESE through research, teaching, and service—envisioning a future where all people have access to education that promotes the learning, awareness, attitudes, and skills necessary to help achieve a sustainable world (Pizmony-Levy et. al., 2018). The Working Group's mission is to produce high-quality research on educative practices that promote sustainability and the long-term health of complex living systems, and then translate this research into change through professional development and public engagement. The Working Group's unique research mission therefore created a need for TC to have access to the DOE and schools in the city.

Research Partnership Formation and Analysis

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Partnership Formation

The DOE-TC research partnership was created to help meet the complimentary needs of the two partners. The partnership enhances and informs policy and programming for the Office of Sustainability, and also supports the work of Sustainability Coordinators in schools. These efforts, in turn, help TC meet its Working Group needs and provide real-word learning opportunities for students and faculty. A key strength of this relationship is that it is not funded by a third party (e.g., foundations and corporations), allowing the partners to focus solely on meeting their needs and improving sustainability. Through applied social research such as surveys, focus groups, and observations, the partnership has produced insights about the current state of school engagement with sustainability and mapped the drivers and barriers for effective plan implementation in the areas of waste diversion, energy efficiency, and ESE. The success of this partnership, however, did not happen overnight.

Creating lasting research partnerships takes significant time and resources, yet the critical early stages of this process are often overlooked. As illustrated in Table 1, below, the initial contact between the DOE and TC teams came in early 2014. At that time, the first author of this paper invited the former Director of the Office of Sustainability (Dr. Sharon Jaye) to share her work in an ESE course on TC's campus. This presentation inspired several students to focus their final papers on the topic of ESE in NYC public schools. One of these papers analyzed collaborations between schools and community-based organizations (CBOs) and was ultimately developed into a larger study (Pizmony-Levy and Fernandez, 2015). The TC team shared the results of this study with the DOE, which went on to use the findings to better allocate partnerships with CBOs amongst schools in the city.

Successful early interactions like this led to the first official collaboration between the

DOE and TC in early 2015. For that project, the TC-based team analyzed DOE administrative

data and conducted interviews with Sustainability Coordinators and CBOs to better understand

how the policy stated in the Chancellor's Regulation is actualized. The DOE and TC were both

involved in crafting the guiding research question for this collaboration, the results of which

were presented at several DOE events (Pizmony-Levy, 2015). By building trust and transparent

working relationships, these engagements helped create the foundation for the long-term success

of the research partnership.

In late 2016, the DOE-TC partnership entered its next stage when the new Director of the

Office of Sustainability identified a need to analyze data previously collected and improve the

Office's existing means to capture data as enabled by Chancellor's Regulation A-850. By doing

so, the DOE sought to better understand what type of person was being designated as the

Sustainability Coordinator in schools in order to examine trends and identify opportunities for

growth, improvement, and support. At the DOE's behest, a TC-based team analyzed data

collected by a third party through the 2016 Sustainability Plan. The TC team's successful

completion of this complex task (the data were originally collected to create a dashboard on

school sustainability—not aid in system-wide research) led the DOE to engage TC in the

redesign and administration of subsequent sustainability plans and annual sustainability surveys.

Findings from this collaborative work were presented to the DOE staff as well as to DOE

partners, educators, and other stakeholders.[3] These presentations helped generate new research

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[3] For example, the first author of the paper delivered a keynote address, based on ESE
scholarship and findings from the research partnership, as part of training for Sustainability
Coordinators.

questions and inform DOE policy and programing. Eventually, the DOE-TC collaboration led to the creation of the Data Analyst position within the Office of Sustainability to help manage this work. As part of a two-way exchange, members of DOE's leadership (the second and third authors of this paper) shared their work with TC faculty and students.

Although the overall experience was positive and productive for both the DOE and TC teams, it should be noted that university-community research partnerships can be challenging. A constant tension exists due to the differing principles and priorities that guide each organization. For example, the TC team generally wanted to keep the surveys similar across the years to better measure change, while the DOE team sought to update and revise different measures to better capture what was happening in the field. Similarly, other challenges arose because the problems and issues confronting the DOE do not neatly align themselves with the academic disciplines of fields of study at TC (Kellogg Commission, 1999). Throughout the process, therefore, efforts were made by both partners to balance input and mutually respect each other's expertise.

Partnership Research Use Analysis

The formation process described above culminated in the now well-established DOE-TC research partnership. As illustrated in Table 2, below, several inquiries were implemented through the partnership to improve school engagement with ESE. This section explores these inquiries through the lens of research use, including instrumental use, conceptual use, and process benefits from engagement (Davies & Nutley, 2008).

Table 2 – about here

Instrumental use. Much of the work exploring research use has focused on instrumental use where policymakers and practitioners use research-based knowledge to inform and direct

specific actions and programmatic decisions (Davies & Nutley, 2008). This kind of relationship between research and policy aligns with Trowler's (2003) "engineering model," in which research informs policymakers about the facts and, in turn, proposes solutions to problems. In the case of the research partnership, the DOE often uses evidence produced by the partnership in an instrumental fashion. This makes sense given the rationale behind the Plan-Do-Study-Act cycles. The following three examples illustrate this pattern.

The first example of how the DOE uses evidence in an instrumental fashion relates to the way Sustainability Coordinators are supported and compensated. Although current policy requires every public school to appoint a Sustainability Coordinator, the policy does not stipulate any funding. For the most part, therefore, the position of Sustainability Coordinator is unpaid. Critics of the policy point to the lack of compensation as a critical weakness and call for public investment in hiring full-time Coordinators.[4] As a preliminary step to addressing this critique, the partnership launched an inquiry into existing school supports that are available to Coordinators and the extent to which these supports are associated with stronger engagement. Through interviews and focus groups with principals and Coordinators, it became apparent that certain principals employ creative solutions to better support the work of their Coordinators.[5] Data from the 2017 Sustainability Plan Survey established that about half (47.0%) of the Coordinators receive at least one type of school support. In addition, a link exists between school supports and stronger engagement with sustainability practices. Coordinators receiving at least one type of school support were more likely to engage with energy conservation and waste management.

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[4] An estimated cost for hiring fulltime Sustainability Coordinators in every public school in New York City is close to 100 million USD per year.

[5] For example, some principals use preparation periods or school-based options, which allow schools to modify the collective bargaining agreement to better meet the needs and philosophy of their school community (UFT, n.d.).

Findings from this inquiry, in turn, informed the design of communication materials. The DOE prepared a checklist for principals outlining different ways to provide time/support for Coordinators. The DOE also prepared handouts for teacher Coordinators detailing the options available for them to allocate more time to this role. Both documents are intended to raise awareness to the availability of school supports.

The second example of how the DOE uses evidence in an instrumental fashion centers on professional development. Education scholars agree that active participation in continuing, high-quality professional development is critical for new policies to be successfully implemented and for the overall professionalization of the field (for a discussion on what makes professional development effective, see Garet et. al., 2001). The partnership's research, however, repeatedly revealed that only a small portion of Sustainability Coordinators has participated in training offered by the DOE or other CBOs. In AY 2017/2018, only one-quarter of Coordinators (24.5%) attended at least one workshop organized by the DOE. The discovery of this low figure led to an exploration of the kinds of barriers that prevent Coordinators from attending training and the topics/issues they find interesting or important. Survey data and qualitative data analysis revealed that time and participation in prior trainings are the two main reasons for Coordinators not attending training sessions. These results also showed, however, that Coordinators are generally interested in learning about green spaces (e.g., school gardens and living roofs) and a full two-thirds are interested in attending short, web-based training. Using this evidence, the DOE changed its training offering for AY 2018/2019, creating a completely revised training opportunity for newly designated Coordinators, titled "Sustainability 101 Training." In addition to providing a framework for the role, the training sessions included workshops on the importance of sustainability, leadership and capacity building, how to engage students with

sustainability and start a green team, and how to create a school sustainability plan. DOE and TC also piloted a series of webinars on sustainability. Preliminary feedback shows growing interest in the training sessions.

The third, and final, example of how the DOE uses evidence in an instrumental fashion focuses on engaging students through green teams. Scholars have documented the positive impact of environmental clubs on student engagement with ESE (McDuff, 2010; Said, Yahaya and Ahmadun, 2007). The partnership's research shows that one-third (36.0%) of all Coordinators are working with a student green team, and 62.0% are planning to establish a green team in the future. To support these efforts, the DOE and TC organized a webinar explaining how to work with green teams. TC, in coordination with the DOE, allocated three fellowships (one in AY 2017/2018, and two in AY 2018/2019) for students to assist Title I schools (those that, because they have a large concentration of low-income students, receive supplemental funds to assist in meeting students' educational goals) with developing a school green team (Kessler, 2018). Preliminary feedback suggests that this model is working, but more development is required to better equip the fellows with knowledge on mentoring and organizational change.

Conceptual use. Decision-making can be complex and is often not a linear process. In such instances, there is not a direct link to decisions, but rather a gradual diffusion of theory and data into the sphere of organizational decision-making (Weiss, 1980). Theory and data may also be absorbed into professional or tacit knowledge of practitioners (Davies & Nutley, 2008). Research-based knowledge serves to promote general "enlightenment" (Trowler, 2003) by clarifying policymakers' assumptions about organizations and the system as a whole. Research-based knowledge also contributes to enriching public discussion. This pattern can be seen in the following two examples.

The first example of how the DOE uses evidence in a conceptual fashion relates to the

misconceptions regarding Sustainability Coordinators and the implementation of the

Chancellor's Regulation. Prior to the research partnership, the DOE lacked key information

about the population of Sustainability Coordinators, such as their professional background,

experience, and motivation. Given this lack of information, two common assumptions were often

made: (1) Coordinators are mostly science teachers, and (2) the position experiences significant

turnover and instability. The partnership's research analysis, however, debunked these

assumptions. In reality, less than half of Coordinators (44.0%) are teachers, while approximately

one-third (30.0%) are assistant principals and the rest (26.0%) have other roles in their schools

(e.g., secretary or librarian). Among teacher Coordinators, about half (49.0%) are science

teachers, with other common backgrounds being special education (10.0%), English language

arts (6.0%), and physical education (6.0%). Notably, only one-third (33.0%) of Coordinators are

newly designated to their role. To help process this information, the DOE shared these findings

with partners and stakeholders to consider new ways to engage the diverse population of

Coordinators. Due to the fact this work was made publicly available on the Internet (Pizmony-

Levy, 2018), these findings were included in public discourse about new sustainability initiatives

(see *New York Times* article by Barron, 2018).

The second example of how the DOE uses evidence in a conceptual fashion relates to the

meaning of sustainability and sustainable development. Recognizing that these terms are vague

and contested (Little, 2014; Wals, & Jickling, 2002), the research partnership initiated a study to

assess how Sustainability Coordinators make sense of the term "sustainability." Using the 2016

Sustainability Plan Survey platform, Coordinators were asked to define the term "sustainability"

in their own words. A qualitative coding of close to 1,400 open-ended definitions was then

conducted to identify main themes and co-mentioning patterns. Findings from this study suggest that Coordinators tend to focus on the environmental pillar of sustainability while overlooking the economic and social pillars. In turn, Coordinators view sustainability as related to waste management, pollution, and energy conservation. Importantly, almost no variation based on professional background or other characteristics was found. The environmental and recourse management foci echo the legacy of the Office of Sustainability and its strong connections to the city's goals (e.g., diversion of solid waste from landfills and reduction in greenhouse gas emissions). The DOE used these findings to inform professional development activities and further conversations. By pointing to the gap between the broad definition of sustainability and the relatively narrow definition held by Coordinators, the Office of Sustainability was able to reframe the discussion on ESE in city schools and connect with additional partners inside and outside the DOE.

Process benefits from engagement with research. Although evidence plays a significant role in informing decision-making, engagement in the process of producing research-based knowledge can also have an impact on policymakers and practitioners (Davies & Nutley, 2008). Through participation in the process of production of knowledge, participants can begin to change their ways of thinking about social problems and solutions. For example, when asked to comment about any of the topics discussed in the Sustainability Plan or Annual Sustainability Survey, several Coordinators mentioned the instruments helped them to better understand their role, the expectations of the DOE, and the possibilities for engagement. The following Coordinator quotes illustrate this point:

- "The survey offered me a list of ideas for which to start with! Thank you!"

- "This was a very good survey. It encouraged me to really reflect on my Sustainability practices. Thank you for making it easy to comprehend."

- "I am very interested in pursuing a collaboration with different non-profits and city agencies that were listed on this survey to help in implementing sustainability programs at my school. I was not familiar will all of the organizations on the list, and am willing to reach out for outside support."

In addition to informing Coordinators of the scope of their role, the research instruments also have the capacity to create greater awareness of the importance of the Sustainability Coordinator role for principals. This is important because principals are solely responsible for designating the Coordinator role to a member of their staff on an annual basis. A better organized and accessible Sustainability Plan can result in a more informed principal who, in turn, will be more likely to select a Sustainability Coordinator properly suited for the role. This idea is reflected in the following quote:

- "I'm quite embarrass[ed] by this survey. I didn't have any idea what was involve being a sustainability coordinator. Not sure if my principal does either because I don't think she would have chosen me to for this position."

The above analysis of the DOE-TC research partnership demonstrates that the DOE used evidence in three distinct ways: instrumental, conceptual, and in a process-oriented fashion. Although Davies and Nutley (2008) point to other types of evidence use or misuse (e.g., strategic, political, and tactical) no misuse of the data was identified. This non-finding could be related to the high level of trust between the DOE and TC, or the possibility that the authors are too close to the research partnership and cannot objectively observe all types of use or misuse.

Conclusion

Research on ESE in urban contexts is more important than ever given that over half of all humanity now lives in urban areas (UN, 2018). Indeed, the Sustainable Development Goals set by the United Nations General Assembly in 2015 recognize the impact of urban spaces on sustainability (e.g., Goal 11: Sustainable cities and communities). This timely paper contributes to ESE literature in two ways. First, the paper focuses on a unique policy in New York City through the examination of a research partnership between the local government (DOE Office of Sustainability) and a higher education institute (TC). Second, the paper draws on two emerging literatures within the broad field of educational policy and politics: (1) the application of improvement science to education, and (2) how research-based knowledge gets used.

Overall, the DOE-TC research partnership has been mutually beneficial. Research-based knowledge co-produced by both organizations has been—and continues to be—used to inform sustainability policy and practice in the city. In certain cases, the use is more instrumental, while in others it is more conceptual or diffuse. Regardless, the partnership's experience points to a productive exchange between research and policy.

Existing literature indicates that four factors likely helped to facilitate this productive research partnership. First, relationships between researchers and stakeholders matter (DuMont, 2015). The fact that both organizations are co-located in New York City allows for regular in-person meetings, opportunities for socializing, and shared understanding of the locale. A partnership with separate locales would present fewer opportunities for team members to develop strong working relationships. Second, trust is important for successful cooperation to flourish in and between organizations. Mutual trust and appreciation between the DOE and TC teams was able to build through repeated, successful, and respectful interactions. Third, the knowledge

produced was local and relevant (Honig and Coburn, 2008). The DOE and other key stakeholders did not need to "translate" the research in order to apply it to their own context and experience. Fourth, the research partnership committed to work through improvement cycles that prioritized research-based knowledge and action (Bryk et al., 2015). This commitment to disciplinary exploration and action through policy and programming helped ensure the collaboration produced—and will continue to produce—meaningful outcomes.

So, what comes next for the partnership and ESE in New York City? The city's current ESE policy relies on programs that are either made available to schools by CBOs and/or driven by the DOE (Office of Sustainability, STEM, CTE, Service Learning, etc.) To make sure the public schools system is making a sustained improvement in terms of engagement with ESE, there is a need for strong collaboration across all agencies and CBOs. In line with ideas from Bryk and his associates (2015), the DOE-TC research partnership can be seen as a potential foundation for establishing a networked improvement community (NIC) dedicated to ESE. NICs are scientific learning communities encompassing a diverse set of stakeholders—such as local school districts, colleges and universities, local businesses, CBOs/NGOs, and foundations—committed to using improvement science to solve problems of practice. An ESE-focused NIC in New York City would go a long way towards advancing sustainability goals.

Going forward, further research on the relationship between research and policy in the field of ESE could develop in several different ways. Formal qualitative studies could document and explore additional cases/examples of research partnerships. A comparative study of partnerships could shed light on the role of the socio-political context in shaping partnerships. Another possible direction could be to investigate the role of research-based knowledge and other types of knowledge in the design of ESE policies. Applying social network analysis to

policy documents, for example, could point to highly cited resources (see for example: Baek et. al, 2018).

In sum, this paper illuminates one potential role institutions of higher education can play in helping to combat global climate change. As evidenced above, a university-based team can successfully partner with a governmental agency to support and enrich ESE policy and practice on a wide scale. In time when public discourse can be critical of higher education institutions (Brown, 2018; Drezner, Pizmony-Levy, and Pallas, 2018), it is all the more important for researchers to work closely with local communities to demonstrate their contribution to the collective good.

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Figure 1: The six core principles of improvement

1. Make the work problem-specific and user-centered.
It starts with a single question: "What specifically is the problem we are trying to solve?" It enlivens a co-development orientation: engage key participants early and often.

2. Variation in performance is the core problem to address.
The critical issue is not what works, but rather what works, for whom and under what set of conditions. Aim to advance efficacy reliably at scale.

3. See the system that produces the current outcomes.
It is hard to improve what you do not fully understand. Go and see how local conditions shape work processes. Make your hypotheses for change public and clear.

4. We cannot improve at scale what we cannot measure.
Embed measures of key outcomes and processes to track if change is an improvement. We intervene in complex organizations. Anticipate unintended consequences and measure these too.

5. Anchor practice improvement in disciplined inquiry.
Engage rapid cycles of Plan, Do, Study, Act (PDSA) to learn fast, fail fast, and improve quickly. That failures may occur is not the problem; that we fail to learn from them is.

6. Accelerate improvements through networked communities.
Embrace the wisdom of crowds. We can accomplish more together than even the best of us can accomplish alone.

Source: Carnegie Foundation for the Advancement of Teaching, 2019.

Figure 2: Annual indicators of four sustainability education activities in New York City Department of Education
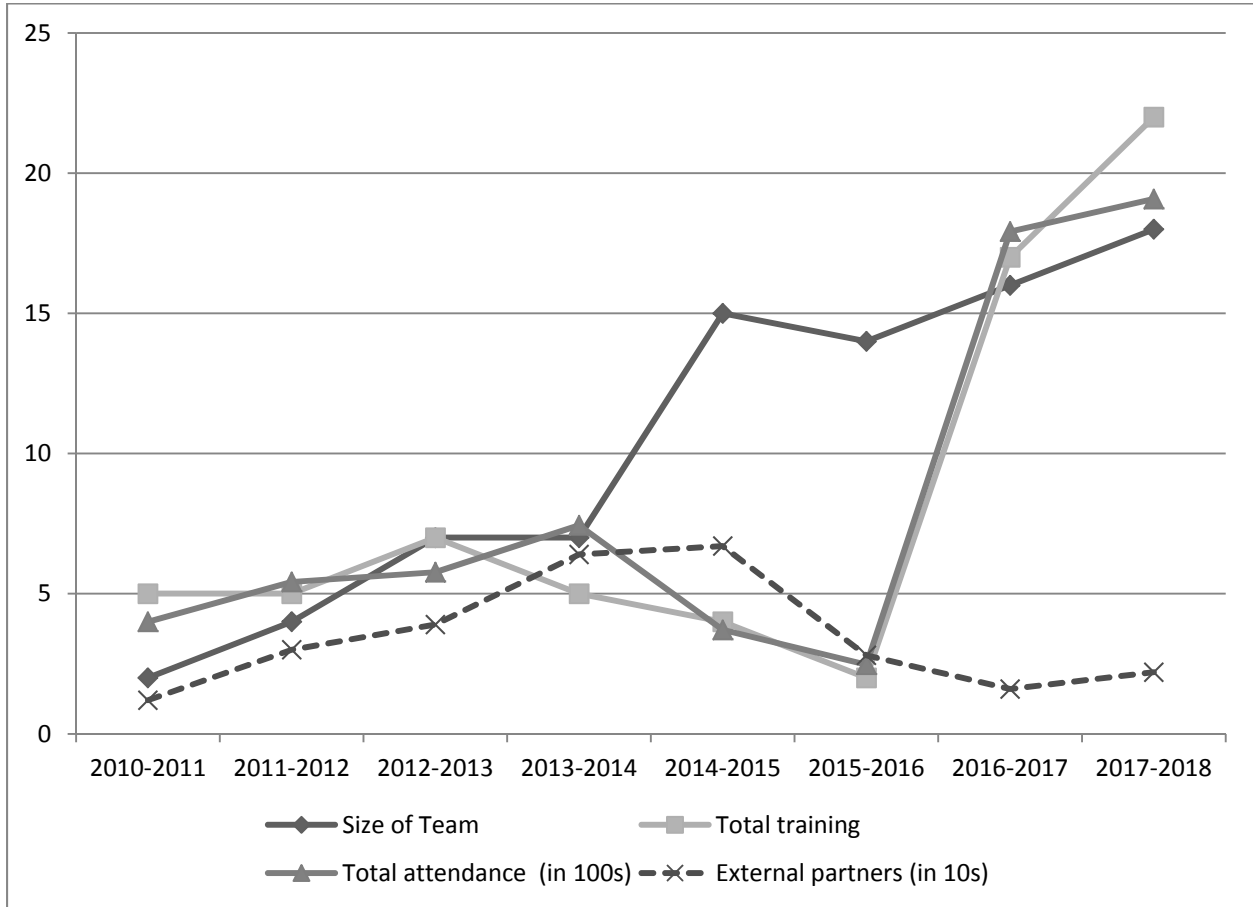
Table 1: Timeline and activities for DOE-TC research partnership

Year	Quarter	DOE presentation at TC	TC presentation at DOE	DOE-TC share work with others	Research activity	Ad-hoc meetings	Regular meetings
2014	1st	+			+	+	
	2nd				+		
	3rd						
	4th						
2015	1st	+			++	+	
	2nd			+	+	+	
	3rd						
	4th						
2016	1st					+	
	2nd						
	3rd				++	+	
	4th				++		
2017	1st	+	+		+	+	
	2nd		+	+	++	+	+
	3rd				+++		+
	4th				+++		++
2018	1st	+	++	++	+	+	++
	2nd				++		++
	3rd				+++	+	++
	4th				+++		++

Note: Quarters (1st January-March; 2nd April-June; 3rd July-September; 4th October-December); activity level (+ low; ++ medium; +++ high).

Table 2: Selected projects of the DOE-TC research partnership 2014-2018

Project	Guiding question	Partnership structure	Action / Use
1	Who are the Sustainability Coordinators? What is their professional background? What motivate them to work on ESE projects?	* Quantitative analysis of DOE data.	DOE use information in conversations with policy-makers and partners to debunk misconceptions.
2	How do Sustainability Coordinators define the terms sustainability and sustainable development? Is there a shared understanding of the term?	* Qualitative study of open-ended data collected through a survey. Social network analysis of co-mentioned themes. * Quantitative analysis of DOE data.	DOE use information in strategic planning and in professional development.
3	What barriers prevent Sustainability Coordinators from attending ESE-related professional development?	* Quantitative analysis of DOE data.	DOE revamped professional development offerings, and introduced a basic training for new Coordinators. DOE and TC piloted a webinar, and TC submitted a grant for piloting a series of webinars.
4	To what extent Sustainability Coordinators are known or visible to the school community?	* Quantitative analysis of DOE data.	DOE created a reusable poster that indicates the name of the school sustainability Coordinator and several sustainability goals.
5	To what extent schools support their Sustainability Coordinators in order to do enhance their engagement with ESE?	* Qualitative study using interviews and focus groups. * Quantitative analysis of DOE data, including descriptive statistics and ─cross-tabulations.	DOE prepared a principal checklist and handouts for Sustainability Coordinators.
6	To what extent Sustainability Coordinators engage students through green teams? What are the common practices for working green teams?	* Quantitative analysis of DOE data. * Action research in four schools that offer a green team.	DOE and TC piloted a webinar on how to work with school green team. DOE and TC implemented a mentoring program for schools interested in establishing a student green team.
7	What types of school engagement with ESE exists in the system? How these types of engagement vary across individual and school characteristics?	* Latent Class Analysis to identify underlining types of school engagement with ESE. * Quantitative analysis of DOE data.	DOE use information in conversations with policy-makers and partners to advocate for policy revisions.
8	How (do) Sustainability Coordinators learn from each other?	* Social network analysis of DOE data. * Qualitative study using interviews.	DOE use information in strategic planning and in professional development.

Bios

Oren Pizmony-Levy is an Assistant Professor of International and Comparative Education at Teachers College, Columbia University. His research interests lie in the areas of comparative sociology of education, globalization and transnational sociology. Through diverse set of research methods (quantitative, qualitative and social network analysis), he studies the roots and impact of global educational movements – including international large-scale assessments, environmental and sustainability education, and LGBT education. His recent publications appeared in *Comparative Education Review*; *Oxford Review of Education;* and *Globalisation, Societies and Education.*

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