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## Transforming sustainable food and waste behaviors by realigning domains of knowledge in our education system

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## ABSTRACT

Changing from current unsustainable production, consumption, and disposal patterns will clearly require technological, political and other structural changes, but also individual behavior change. Consumer demand and individuals' purchasing power exerts pressure on many parts of the production system, including how crops are produced (e.g., organic), products are packaged and labeled (e.g., rBGH-free labels on milk), and even where products are distributed and how they are disposed of. Individual consumer behaviors have even led to political and structural changes over time, such as the consumer boycott of tuna which led to 1990 US legislation creating the "Dolphin Safe" tuna label.

One of the central ways to foster responsible citizenry and promote sustainable production is to harness the capacity of teachers and schools to create change. Educating for conscious consumerism is a critical part of creating changes in production, consumption and disposal systems, but our current education system and approaches often reinforce unsustainable practices that neglect subjective ways of knowing as well as action and change. Research and experience suggests that traditional, information intensive teaching about sustainability alone does not motivate the behavior change a transition to sustainability will require. Utilizing a previously developed framework that identifies four distinct types of knowledge—declarative, procedural, effectiveness and social—we hypothesize that procedural, effectiveness and social knowledge are important predictors of an individual's participation in sustainable behaviors, while declarative (information) knowledge is not. While the knowledge domain framework has been theoretically detailed by other researchers (Kaiser and Fuhrer, 2003; Frisk and Larson, 2011) and qualitatively assessed through an intensive case study education program (Redman, 2013), to date, this is the first quantitative assessment of the relationship between the four domains of knowledge and sustainability-related behaviors.

We tested our hypothesis through an extensive survey of 346 current and future K-12 teachers about sustainable food and waste knowledge and behaviors. The survey results supported our hypothesis that high levels of declarative knowledge alone did not predict increased participation in sustainable behaviors while procedural and social knowledge were statistically significant predictors of sustainable food behaviors and procedural, effectiveness, and social knowledge were all statistically significant predictors of sustainable waste behaviors. Through active incorporation of appropriate forms of procedural, effectiveness, and social knowledge into the K-12 classroom, educators can empower the next generation to make individual changes based on their vision of the future and insist on structural and institutional changes that are essential for a successful transition to sustainability.

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### 1. Introduction

Sustainability advocates widely recognize that many consumer behaviors will need to change in order for society to achieve a sustainability transition that will meet human needs, reduce social

inequities and maintain the natural resources necessary to support human life on Earth (Heller and Keoleian, 2003; Leiserowitz et al., 2005). Prominent behavior researcher, Paul Stern, suggests that "changing environmentally significant consumer behavior" is critical for an array of policy decisions and interventions, including the introduction of new and beneficial technology, modifications of institutional structures, and for changing material or financial incentives (Stern, 1999, p. 461). Through this research we focus on consumer behaviors as they relate to sustainable food and waste

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strategies. Food and waste systems are embedded within a complex array of political, technological, and institutional structures, yet, it has been seen that individual consumer demand and purchasing power can, over time, impact these structures and promote change throughout the production, consumption, and disposal phases (Heller and Keoleian, 2003). One such example of consumer behaviors impacting political change and production processes is the consumer boycott of tuna that led to the 1990 US legislation creating the “Dolphin Safe” tuna label (Wright, 2000). A number of other researchers have also concluded that one of the most effective strategies for enhancing the sustainability of the U.S. food system (including waste and disposal processes) exists in changing consumer behavior (Heller and Keoleian, 2003; Stagl, 2002).

While other researchers have clearly established the importance of targeting individuals' behaviors in order to create sustainable change, diffusion of many sustainable practices and behaviors has yet to take-off; in part due to erroneous assumptions about how change occurs (McKenzie-Mohr, 2000; Rogers, 2003). First, some researchers are influenced by an innovation bias and implicitly assume that a great new idea, practice, or technology will inevitably diffuse throughout most of society on its own because it is cleaner, healthier, safer, more efficient, and/or more sustainable (Rogers, 2003). Separately, there are others that recognize individual behaviors as a central part of creating collective change but proceed on the faulty assumption that simply providing information (e.g., through marketing, labeling, or education) will foster the targeted behavior change (Kollmuss and Agyeman, 2002; Monroe, 2003; Pooley and O'Connor, 2000; Simmons and Volk, 2002). This research, on the other hand, proceeds on the notion that creating a more sustainable product, idea, or practice and providing information regarding said product will not, on its own, lead to the desired collective change. Rather we should understand what motivates or constrains individual behaviors and create programs that move beyond information in order to target the predictors of behavior.

In targeting the adoption of specific behaviors, many scholars and practitioners have turned to education as a pivotal tool in creating long-term change (Kelder et al., 1994; Luepker et al., 1983). There are a number of fields with which to draw from regarding the relationship between education and behavior modification (health, drug, smoking, and anti-violence programs to name a few). We focus on environmental education literature, in part, due to the parallels often drawn between sustainability and environmental education—although sustainability is a distinct departure from environmental education and the associated nature-centric points of view. For decades the primary goal of environmental education has been to foster pro-environmental behaviors (Hungerford and Volk, 1990; Monroe, 2003; Pooley and O'Connor, 2000; Ramsey, 1993). However, as education psychologists, Pooley and O'Connor note, “The main focus of environmental education programs has been to change environmental behavior through increasing environmental knowledge” (2000, p. 711). This focus on environmental (declarative) information as the means for targeting behaviors has been termed the Information-Deficit Model (e.g., students just need to understand the environment and then they will behave in a pro-environmental manner). This simplistic, linear approach to behavior change has been found to be inadequate in addressing the motivators and impediments to changing behaviors (Kollmuss and Agyeman, 2002; Monroe, 2003; Pooley and O'Connor, 2000). Therefore, this research looks beyond information as a predictor of behavior in order to explore diverse, dynamic and often subjective ways of knowing that influence participation in sustainable food and waste practices amongst K-12 educators (see Section 1.2 for details on the selection of our target population).

While this article focuses on a select number of sustainable behaviors, the incorporation of multiple forms of knowledge has

broader implications for all sustainability education. First, we emphasize that sustainability knowledge is not confined to scientific information or codified facts; rather it incorporates subjective ways of knowing that allow for diverse values and perspectives. In order to educate for sustainability in a way that integrates different ways of knowing, pedagogical approaches must also become more reflexive, integrative, and collaborative (DuPuis and Ball, 2013). Hence, the approach taken here also suggests a need to depart from didactic pedagogies in which an expert disseminates facts to passive recipients. Previous research has linked the knowledge domains to an array of innovative pedagogy, including real-world, experiential, problem-based, and collaborative methods, in order to emphasize social learning processes (Redman, 2013). To effectively integrate this approach into classrooms and schools, a shift away from traditional, positivistic views of science needs to occur. If universities can embrace a change to post-normal science, teachers whom receive their training at universities will become acquainted with science through this more participatory, normative and inclusive approach that acknowledges multiple ways of knowing (Funtowicz and Ravetz, 2003).

### 1.1. Knowledge domains

In order to move away from the Information-Deficit Model of behavior change, this research drew on behavioral theories and related studies in order to inform the relationship between education and action. While behavior scientists have proposed a variety of useful frameworks for explaining individual action, we chose to use a framework proposed by Kaiser and Fuhrer (2003) that centers on four different domains of knowledge as an organizational tool: declarative (factual/technical socio-ecological information), procedural (how-to information and skills), effectiveness (subjective understanding of impacts/efficacy), and social (subjective understanding of normative trends and social expectations) (Redman, 2013; Kaiser and Fuhrer, 2003). While the knowledge domains are insufficient individually to entirely explain the motivations behind people's actions, they collectively provide an overarching framework for integrating an array of behavioral theories (Frisk and Larson, 2011). The approach to the knowledge domains taken here expands beyond the traditional views of knowledge in order to include the subjective and dynamic processing of our environment as a form of knowledge. In this manner, we have integrated concepts about values, norms, attitudes and beliefs developed by other behavioral scholars into the domain constructs (Ajzen, 1985; Cialdini et al., 1990; Stern, 2000). Below we briefly define each domain as they relate to various schools of thought regarding environmentally responsible behaviors.

Declarative knowledge typically addresses how environmental systems operate in factual, technical, mechanical or biophysical terms, such as information about the ecological structure, functioning of ecosystems, and social-ecological interactions (Kaiser and Fuhrer, 2003). Although research has suggested that this is the least effective type of knowledge in promoting pro-environmental behaviors, most educators focus on disseminating declarative knowledge (Pooley and O'Connor, 2000; Simmons and Volk, 2002). Declarative knowledge is emphasized in the Information-Deficit Model (IDM), whereby in a straightforward, linear fashion, environmental knowledge is expected to lead to awareness and concern, and ultimately, to pro-environmental behaviors (Kollmuss and Agyeman, 2002). Psychologists and others have since refuted this simplistic model, noting that changing behavior is very difficult and information is simply not enough to spur the change itself (Kollmuss and Agyeman, 2002).

Procedural knowledge refers to process knowledge and how-to skills—such as how to sort garbage into recyclables and non-

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