



Contents lists available at ScienceDirect

Resources, Conservation and Recycling

journal homepage: www.elsevier.com/locate/resconrec

Development of a framework to implement a recycling program in an elementary school

Miriam N. Ward^a, Blake Wells^a, Vasil Diyamandoglu^{b,*}^a Sustainability in the Urban Environment Program The City College of New York, 160 Convent Avenue, New York, NY 10031, United States^b Department of Civil Engineering, Grove School of Engineering, The City College of New York, 160 Convent Avenue, New York, NY 10031, United States

ARTICLE INFO

Article history:

Received 22 February 2013

Received in revised form 26 February 2014

Accepted 26 February 2014

Available online 25 March 2014

Keywords:

Waste reduction at source

Source separation

Accountability, Elementary school

Waste audit

ABSTRACT

This study developed a system to plan, evaluate, implement, and monitor a waste reduction and source-separation program, which was then tested through a field study in a New York City elementary school. Despite efforts to implement integrated waste management in elementary schools, appropriate planning tools that document performance and support program development are lacking. To fill this gap, a system for analyzing existing programs was developed. After identifying the phases required for a successful program, a scoring system was developed to quantify the performance of existing programs. To assess existing protocol, recommendations from leading municipalities were reviewed, and the performance of existing programs was quantified within the scoring system. The existing protocol was found to contain similarities, but an overarching approach was needed to connect the provisions with programs that have been successfully deployed. From this analysis, a scoring system was developed to take into consideration the major elements needed for a waste reduction and source-separation plan, colloquially referred to as a recycling plan, as well as the specifics of implementation. This system allows for the review of programs already developed, and can pinpoint limitations prior to implementation. The framework was evaluated through the test case school, with both waste audit data and diagrams. From the lessons learned, successful techniques and recommendations for utilizing this framework were created.

© 2014 Published by Elsevier B.V.

1. Introduction

The objective of the study was to create and test a methodology for developing a functioning waste-reduction and source-separation plan that works within the needs of an existing school. The challenge was to create a tool for educators to help them develop an individualized plan that works with the strengths and challenges of their school. This formula was used to devise a comprehensive, low-technology, economically feasible waste reduction and source-separation program suited to a particular context and adapted by teachers and administrators who implemented it. Formulating a new school recycling program required identifying the reasons such programs have been ineffective in other schools and investigating in detail the strategies of successful models and programs. A framework for analysis was developed to identify the structural elements that must be in place to successfully realize

a waste-reduction and source-separation program and evaluate a potential program prior to implementation. To document the performance of a field study developed from this methodology, a waste audit documented performance and helped overcome barriers to change.

The focus of this investigation was the development of a methodology to study, evaluate, and support the success of a source-separation plan prior to implementation. A field study of 6 months provided the testing ground to plan, implement, and evaluate a proposed source-separation program, based on this methodology. This program was carried out in a high-performance charter elementary school (Kindergarten-Grade 4, ages 5–10) with 423 students and 45 staff members located within a three-school campus in New York City. The study was directly shaped by the working environment of a multi-campus facility in a municipality that has an established history of mandating and supporting recycling programs. This study focused on identifying and overcoming the obstacles that had prevented the successful fulfillment of existing municipal mandates, with the intention of developing tools to aid the newly created Sustainability Coordinator position. Documenting the difficulties of implementation, while working through the leadership of the administration, highlighted the

* Corresponding author. Tel.: +1 212 650 8039; fax: +1 2126505998.

E-mail addresses: mward03@ccny.cuny.edu (M.N. Ward),bwells00@ccny.cuny.edu (B. Wells), vdiamandoglu@ccny.cuny.edu,vdiamandoglu@gmail.com (V. Diyamandoglu).

entrenched complications of working within the traditional administrative framework.

The field study represented a joint effort where the research team helped to clear entrenched roadblocks to recycling. The school's staff was responsible for implementing the plan, with assistance as requested. The research team was responsible for quantitatively evaluating the effectiveness of the plan and to identify the impact on waste disposal behavior. A five-day waste audit was conducted before and after implementation. From this data, potential areas of improvement, as well as successful resource management techniques, were pinpointed and shared with the administrative staff.

Section 2 provides the findings of a literature review to support the development of the methodology. The proposed system outlined in Section 3 describes the system to support the development, implementation, and evaluation of a recycling program. Section 4 describes the performance of the real world test case at a New York City elementary school. Section 5 analyzes the results along each phase of the developed recycling program. Section 6 describes the main results of the investigation.

2. Background research

Implementing a school recycling program not only shapes current waste management, it also has the potential to influence and improve waste reduction for many years to come. Educating and training students about waste reduction practices reflects a solid waste management strategy to impact long-term behavior (Evans, 2000). In an urban environment, source-separation is a low-cost, straight-forward approach to apply values and principals crucial to sustainable development (Samuelsson and Kaga, 2008). Education in sustainability increases students' capacity to address current environmental concerns and empowers them to become future stewards of their community (Sales et al., 2006). Source-separation is a natural fit with existing education agendas, both ethically and practically. As stated by UNESCO, "Education, in short, is humanity's best hope and most effective means in the quest to achieve sustainable development" (UNESCO, 1997).

Research focused on examining case studies and developing methods of comparison and evaluation. Initial research reviewed institutional recommendations from the Pennsylvania DEP, New York WasteLess, and the Los Angeles County Department of Public Works to identify consistent aspects as well as the order required for the realization of a recycling plan (PA DEP, 2014; LACDPW, 2011; NYC WasteLess, 2013). Recommendations specific to schools, as well as business and institutional guidelines, were reviewed to balance educational needs with quantification guidelines. The recommendations were simplified through diagrams and compared for similar structures. From this process, phases to delineate the major components were identified, as shown in Section 3.1.

A series of case studies were identified, focusing on the analysis of schools that collected quantifiable data about source-separation. The case studies initially examined schools with similar demographics, ages 5–10 and approximately 500 students. Two case studies, one in New Jersey and one in Arizona, were examined where the recycling programs had extensive waste audit information, but a limited set of elements (Brown et al., 2007). This documentation allowed the authors of the study to analyze the efficacy of each recycling program through the waste audit. While the plans contained few program elements, the data analysis yielded valuable insights when connected to the implementation plan. For example, one program, Black Mountain Elementary School in Arizona excelled in engaging students, but struggled in achieving full staff involvement, resulting in different source-separation rates between student and staff areas (Ward et al., 2011). Neither study,

had the same guidelines for waste audit methodology or data collection.

The criteria were expanded to collect information on case studies with broader demographics and more qualitative value. The next set of schools examined involved 13 elementary schools that participated in the King County Green Schools Program in Seattle, Washington (King County, 2013). Class size was unknown, but extensive information about the program parameters and performance was available. Greens Schools seeks to encourage schools and districts within King County to use resources responsibly and become engaged in environmental issues through a voluntary program (King County, 2013). A review of the many self-defined successful case studies indicates that Green Schools has been able to demonstrate quantitative and qualitative results by allowing schools to showcase their strengths and to internally structure their own resources through the use of a level system that is based on earning points in various categories (Table 1).

Twenty schools and four institutional recommendations were reviewed, but the lack of consistent qualitative or quantitative data limited comparative analysis until a framework for comparison was developed. A number of award winning schools in New York City were examined as well (PS156 2010, PS185 2010, PS334 2010, PS192, 2010). Creating a basis for comparison within different data collection standards presented an ongoing difficulty. The narrow scale of the literature review was due to the paucity of programs with published scientific data collection as well as the lack of rigor in the presentation and collection of much of the work. A valuation system was created to score various programs and compare the case studies. The institutional recommendations were also evaluated in this framework for consistency. The comparison system provided the basis for the 'Recycling Phase Point Scorecard' (RPP Scorecard), which was developed as part of this study.

3. The proposed system

3.1. Development of the phase structure

Through the literature review, underlying patterns were identified and examined to structure the logistical planning and maintenance of various plans. Four main phases were proposed as areas required for a successful recycling program: *Catalyst*, *Administration*, *Implementation*, and *Maintenance*. The order of deployment was developed by examining recommendations and municipal guidelines (PA DEP, 2014; LACDPW, 2011; King County, 2013). This system of classification describes aspects that are required to create a tailored recycling program, which justifies expenditure and investment through quantitative results. The first phase, *Catalyst*, must engage the commitment to gain staff support and create internal momentum. The second phase, *Administration*, describes the legwork to properly support and develop a program, including logistical planning. The third phase, *Implementation*, addresses the actual process of changing behavior and the physical changes that are put into practice. The final phase, *Maintenance*, includes evaluation and assessment with a return to planning and implementation if the program is underperforming.

One theme of successful school recycling programs comes through motivation, or the *Catalyst*, which has a direct bearing on ambition and the results. Changing habits within a bureaucratic network requires intentional agency (Moore and Westley, 2011). There are multiple ways to build interest in the staff and therefore momentum in the program. Environmentally sensitive conditions can also foster the development of an ambitious waste reduction program as part of a sustainable vision (Badaracco and Weitzel, 2002). Higher participation rates are found in schools that integrate source-separation into a sustainable education agenda, to

Download English Version:

<https://daneshyari.com/en/article/1062949>

Download Persian Version:

<https://daneshyari.com/article/1062949>

[Daneshyari.com](https://daneshyari.com)