THE TASK OF CREATING PROGRAMS TO PROMOTE SOLAR COOKING

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Abstract: *The task of organizing a full-scale, adjustable program to actively promote solar cooking education in our community has proved challenging. We created four programs - Solar Express Suitcase, Solar Snacks, Build and Cook, Enablers for Good - that are flexible and adaptable to individual learning styles, age, experience and interest levels. The Explore, Demonstrate, Guide and Enable (EDGE) model of Boy Scouts of America provided an excellent framework for our efforts.*
*EXPLORE: The **Solar Express Suitcase** program includes lesson plans, activities, experiments, Copenhagens, recipes and materials. The suitcase offers teachers, summer camps, after school programs and clubs opportunities for group interaction and self-paced exploration of principles related to the science of solar cooking.*
*DEMONSTRATE: The **Solar Snacks** program. Participants discover joys of solar cooking using all senses: hearing, seeing, smelling, tasting and touching. Instructors discuss basic concepts using DARE, and demonstrate safe use and cooking. Participants taste solar cooked snacks.*
*GUIDE: The **Build and Cook** program emphasizes hands-on building of cookers by pattern or through innovation. Guidance is given as needed and appropriate food is safely cooked or water is safely pasteurized.*
*ENABLE: The **Enablers for Good** program encourages participants to become the teachers and to share knowledge with others through a variety of Extension Activities that encompass entrepreneurship, community volunteering, the arts, and more.*
Sharing knowledge is a critical component of solar cooking advocacy and education. By enabling and validating all efforts to promote solar cooking, we show that there is no "wrong way" to participate.

Keywords: Solar cooking, education, programming, community

1.INTRODUCTION

One year after embarking on a mission to provide educational STEM programming for schools and social organizations, The Solar Sisters discovered they had a diverse audience with varying expectations. The interest in solar cooking produced a multitude of leads. The initial projects were diverse and intuitive, with hands-on, creative activities. Developing each individualized program was time consuming, and the expectations were managed through a checklist. Cooking demonstrations and solar oven displays were the most popular programs. Outdoor cooking was run on a "rain or shine" basis due to Ohio's perpetual cloud cover. Finding the right program balance in complexity and participant challenge was the primary program goal. Each project was successfully run, in part, due to meticulous planning and preparation.

During a mission trip to Haiti, the 6 person solar team was charged with expanding the convent kitchen through the use of solar ovens. The existing kitchen was condemned after the 2010 earthquake and the building offered little water or fuel source. The school served over 500 lunches daily from the old kitchen. The solar team was funded, in part, by a Rotary grant which included two Eagle Scouts, demonstrating the use of the Haines solar panel cooker for individual and family distribution. The BSA training method was a teaching model[1]. The E.D.G.E. model is a step by step training technique to impart informaion to another person.

The BSA programs for out-of-school experiences with community partnerships were lauded for impacting student success and a likely extension for solar cooking [2]. From 4H, Big Brother and Sister, the YWCA, Girlstart [3], Inspiring Minds, Youth Mentorship, Junior Achievement and Scouting, organizations serving youth in-and-out of school environments offer the greatest structure for long standing enrichment programs. The programs are not academically centered and provide activities related to interests, leadership, team bonding and group relationships, rather than academic testing links. However, the youth development programming is proven to increase academic success [4]. The Boy Scout Model offered promising training data. The new program design must assess needs and evalualate outcomes to be successful [5]. Solar cooking demonstrations was the tool used to create an interactive, hands on project that has purposful activities with application[5] to everyday life and career pathways.

2. CREATE A NEEDS ASSESSMENT USING EXISTING DATA

The Solar Sister's solar cooking education program is designed to increase the participant's knowledge and skill through active learning and critical thinking. By assessing the content, visibility and location of each program, data developed. Upon examination of the data, the program strengths and needs list was created Available program data indicated the need for customizable program features. Specifying a target audience is helpful in addressing needs.

The data showed that 46% of the total programs were in-school, compared to 54% out-of-school or (social) porgrams. Solar cooking visability was an overreaching goal for all programs. A total of 51 projects completed in fifteen months (21 International and 30 Domestic), provided solar cooking visability to approximately 23,270 people in 26 school related programs and 24 social programs.

The existing program strenths included the variety, creativity, overall visability and total number of projects completed. While the areas of need were in evaluation (finding a tool for pre planning and post assessment) and program expansion and compartmentilizing (one size program does not fit all needs). The question arose: If new programs allow for creative adjustments and adaptation for age and size of group; then, could each new program be a self contained unit or compartment of a larger program? The base of each program would connect to STEM learning goals and maintain a high level
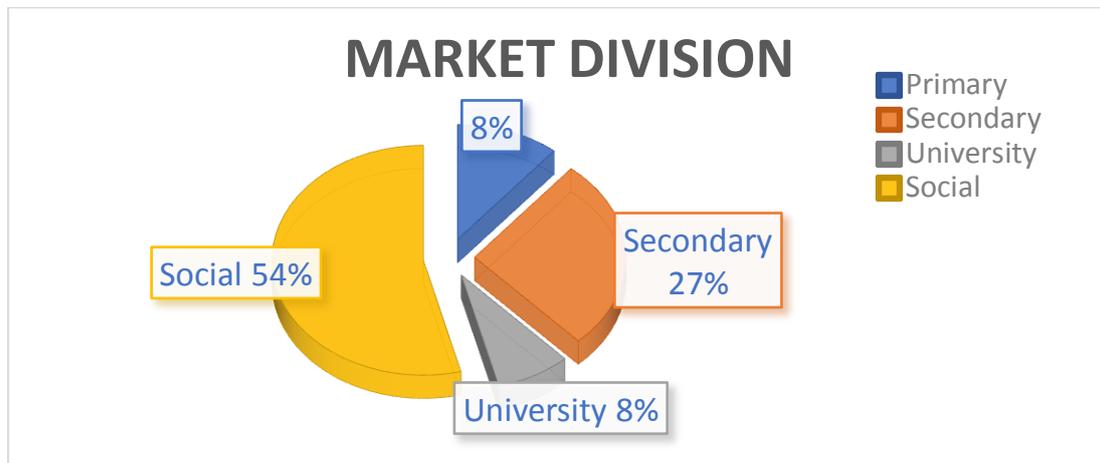
of content customization.

Figure 1. Program Totals - Social vs School

2.1. Domestic and International

Cultural needs and food selections offer locally sourced foods (farm to table when possible) for all programs. Regional variations in cooking style and content are encouraged though active participant involvement. With agressive pre assessment planning and clear input on expected outcomes, both domestic and international programs can run smoothly. By using the data to develop criteria for future programs, the needs assessment starts the strategic planning process.

Domestic programs presented 30 days of projects, allowing 23,676 people visability to solar cooking information through demonstration, workshop, and oven display. Similarly, international projects presented 21 days of programs allowing 1,594 people solar cooking visability [TABLE 1.] If each one shares with one other person, the exponential growth is enormous. No specific target audience was detected.

2.2. Visability

Visability is a difficult number to accurately assess. The visability of the project is determined by group size, number of presentations and each attendee reaching one more person. The data does not include visibility from social media, marketing or advertising for the events. The overall project visability is based on 51 days of projects reaching 23,270 persons both in the United States and abroad. The categories recorded were Shool (primary, secondary and University) and Social (groups, organizations, libraries, centers and businesses). The data showed projects divided into the following categories: primary (1%), secondary (8%), university (1%) and social groups (90%). The mean was 6,317 person visability. The median was 75 people visability and the mode is 200 people visability. The range is 19,996 people [Table 1.].   Further research is necessary to find a way to quantify the visibility. The numbers are conservatively estimated and only included from the Solar Sister projects and those under the Global Development Solutions, 501c3.

Table 1. Solar Sister's Program Table.

	Primary	Secondary	University	Social
Type	11%	27%	8%	54%
Visibility	1%	8%	1%	90%
Domestic	16%	1%	1%	28%
International	0%	12%	0.50%	24%

2.3. Managing Expectations

Moving from an arena where lessons are measured, timed, and outcome driven by testing, to the hybrid programming model for the 21st century [6] makes managing expectations difficult. The important question to answer is: What does a successful program look like? To best manage expectations, information must be communicated both verbally and in writing. The importance of gathering and recording precise information in a pre-program meeting is the first step to a successful project[6]. Use of a pre-program assessment guides the process. Adjusting to changing expectations with each project requires advanced planning, refocusing attention and constantly looking for creative ways to promote solar cooking. Acroynms such as DARE, DARCIE, EDGE, CAREer have value in programs to lend consistency and continuity. Presentations convey material through visual, auditory and written means to address a variety of learning styles.

3. CREATION AND DESIGN

The first step to new program creation is the development of goals and objectives. The Solar Sister's goals promote solar cooking through STEM educational programs, demonstrations and consultation and in   social enterprise and mission work (both in the United Stated and abroad). The objectives are to obtain high visibility through each project, network all contacts for future collaboration, add a scalable element to adjust for time and group size constraints and a usable evaluation tool.
The long range goal is to encourge the use of solar ovens as a fun, environmentlally positive way to cook food.   Through promotion and education, the Solar Sisters are dedicated to the helping solar cooking achieve global acceptance. The hub is Hub-bard Ohio and primary, first level ring of concentration is within a 60 mile radius, to ensure that the effort begins at the local level.
The objectives must be measurable and relevant [7]. Evaluation is a critical component of growth. If no target audience is defined, thus creating a wide possibility for program content, and rendering the evaluation process nearly impossible. Many programs are developed by intuition and experience, should have an element of logic. The EDGE method is model training, the primary purpose of model training is to successfully transfer knowledge from one person to another.[1] By identifying the audience and the target goal the steps of explain, demonstrate, guide and enable are a thorough process to ensure the materials are received by the audience and remembered [1].   Variables exist in motivation, education, interest, aptitude, constraints and cultural differences, but the EDGE method is able to level the varialbles and establish a program format that allows for the most material retention

throughout the demonstration. Using the EDGE method in demonstrations about solar cooking makes the review of oven information methodical. When cooking, the EDGE method works well to reinforce solar cooking principles and safety procedures. After basic understanding is achieved, the EDGE method extends the learning to design, engineering and career pathways using the same steps.[6,7]

4. IMPLEMENTATION

Simple solutions are the best solutions. The EDGE method creates internal consistency with a system of checks and balances. The EDGE method was expanded to create four innovative programs to address the needs of all project education by developing strong goals. All programs are scalable for group size and time allotment.

4.1. Explain

The lending program, **Solar Express Suitcase** includes lesson plans, activities, experiments, Copenhagens, recipes and learning materials for a group of 30. The suitcase offers teachers, summer camps, after school programs and clubs opportunities for group interaction and self-paced exploration of principles related to the science of solar cooking. The Solar Suitcase promotes relationships, engagement with STEM activities, inquiry and participation through purposful activities.

4.2. Demonstrate

The **Solar Snacks** program. Participants discover joys of solar cooking using all five senses:seeing, hearing, smelling, tasting and touch. Facilitators discuss basic concepts of solar cooking using the DARE method, and demonstrate safe use of the cooking ovens. Through creative and informal space utilization, the ovens create an opportunity for participants to make decisions about their learning through relationships and inquirey. Participants taste solar cooked snacks and make connection of solar cooking principles through food.

4.3. Guide

The **Build and Cook** program emphasizes hands-on (minds-on) building of cookers by pattern or through innovation. Guidance is given as needed and appropriate food is safely cooked. An informational resource booklet is included with the take home kit for extensions in learning. This program encourages participation with partners or small groups through reflection and relevance. Students build relationships and have a useable mini Copenhagen panel cooker with clips, black reusable food tin and oven bag. The materials offer individual exploration or continued group activities. Facilitators look for opportunities to reinforce learned information through DARE and practical application and use of the oven. Questions and extended response answers offer peer to peer learning.[7]

4.4. Enable

The **Enablers for Good** program encourages participants to become the teachers and to share knowledge with others through a variety of Extension Activities that encompass entrepreneurship, community volunteering, business, interests, hobbies, career pathways, the arts, and more. Actively engaging participants in real life activities extends the key concepts into every day life, connecting the principles to activities outside of the program. Participation in purposful activities offers a high level

of engagement with STEM due to physical and cognitive engagement. The extensions can be a great exercise to create design, build and improve solar cookers or work on solving global issues.

Sharing knowledge is a critical component of solar cooking advocacy and education.[6]. By enabling and validating all efforts to promote solar cooking, we show that there is no "wrong way" to participate and allow for small or large groups. From self paced discovery to a makers workshop and engineering extensions, this program is now multi-faceted and scalable.

5. EVALUATION, ORGANIZATION AND ASSESSMENT

By integrating an evaluation model into the programming process, important feedback is received from participants, attendees, facilitators and staff. The information provides evidence of the outcomes and determines program merit and project accomplishments. Information and critiques are reviewed to ensure the program objectives have been met. Regularly defining program strengths and needs leads to growth and refined programming. Student and facilitator reflection is assessed by asking open ended questions.
The Twelve Dimensions of Success [8] is the evaluation tool that is commonly used for rating out-of-school STEM programs. The tool is specifically designed for observation by using twelve indicators of program quality. The target assessment areas include features of the learning environment, activity engagement, STEM knowledge and practices and youth development in STEM. Three specific categories within each heading are rated using a 4-point rubric of evidence based observation. The program requires training and evaluation certification [8].

6. CONCLUSIONS

By creating four scalable programs, customization of the solar cooking experience is possible for any age group or interest level. Developing an effective project with learning outcomes keeps programs focused on the goal. The format of the programs gives an opportunity to readjust, if necessary, mid program to ensure consistency and full attendee engagement and active participation.
The key findings are:
- The EDGE Method is simple, versatile and scalable
- The Four solar cooking programs offer easy customization for small or large-scale groups
- The pre-and post-evaluation assessment of each program offers opportunity for growth
- Managing expectations is possible with precise planning and oral and written communication
- Serving groups within a 60-mile radius of a hub, creates a regional distribution business model for increased penetration and visibility for solar cooking.

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