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The Building Blocks of Behavior Change:

A Scientific Approach to Optimizing Impact

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About:

See Change is a research institute devoted to studying and shaping behavior change programs for the greater good. Backed by theory, tested with data, and designed with care, we develop, implement, and evaluate efforts to solve issues that matter to us the most. Find us online and learn more at www.seechangeinstitute.com.

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Introduction

The social and behavioral sciences have a critical role in identifying and understanding the diverse individual, interpersonal, and contextual factors which influence behavior, as well as crafting unique solutions to promote desired behavior changes.[1,2] Whether the goal is to reduce greenhouse gas emissions, improve health and wellbeing, or counteract structural inequalities, designing sustainable and scalable behavior change programs is both critical and complex.

Social and behavioral science researchers have developed a wide range of interventions to encourage behavior change.[3,4] How do program designers select the right intervention(s) to change a specific behavior? Solutions vary considerably by context and depend on the level at which change is being sought. A solution for reducing cigarette smoking at the individual level may involve creating a mobile application that uses behavioral science principles to assist smokers in cessation efforts. A solution at the organizational-level may involve a no-smoking policy at a workplace or university. And a solution at the policy level may involve a city or state cigarette tax with funds used to sponsor anti-smoking ads. In addition to the level of change, a number of other factors may influence intervention design. Both audience characteristics (e.g., knowledge, attitudes) and the behavior characteristics (e.g., frequency, visibility) can be used to inform the design of a solution that will outperform naive efforts.

The Need for a Transdisciplinary Approach

Theories and evidence-based strategies from the fields of psychology, behavioral economics, sociology, and others all offer insights to promote behavior change. Yet, these approaches come with their own (potentially contradictory) assumptions. Considering the smoking cessation example above, a psychological approach may focus on individual values and motivations, a sociological approach on cultural dynamics, and an economic approach on behavioral incentives. Each explains different elements of behavior change that are relevant to different contexts. A transdisciplinary approach that combines these different approaches is most likely to holistically address root causes and lead to sustained behavior change.

In practice, this means developing programs that draw simultaneously from multiple theoretical traditions including psychology, community-based social marketing, sociology, socio-ecology, communications, behavioral economics, organizational behavior, and human-centered design. We advocate for a data-driven, mixed-methods approach involving qualitative and quantitative research, synthesizing insights across these methods to inform recommendations for behavior change solutions. For example, we often combine semi-structured interviews with experiments (e.g., A/B testing) and “big data” mining to examine a problem from multiple perspectives.

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[1] Ochu, C. L., Akande, O. W., Ihekweazu, ... & Ihekweazu, C. (2021). Responding to a Pandemic through Social and Behavior Change Communication: Nigeria's Experience. *Health security*, *19*(2), 223-228.
[2] Mullainathan, S., & Thaler, R. (2000). *Behavioral economics* (No. w7948). National Bureau of Economic Research.
[3] Kok, G., Gottlieb, N. H., Peters, … & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: An intervention mapping approach. *Health Psychology Review*, *10*(3), 297–312.
[4] Ignelzi, P., Peters, J., Randazzo, … & Lutzenhiser, L. (2013). *Paving the way for a richer mix of residential behavior programs* (SCE0334.01). California Investor-Owned Utilities.

Behavior Change as a Process

Behavior is context-dependent and while certain general principles may apply across different contexts, there are no “one-size-fits-all” approaches to effective behavior change programs.[5,6] A technique that one group uses to address a behavior may not work for another due to various factors (e.g., implementation capacity, cost, cultural context, etc.) and a technique that worked five years ago may not work as well today due to societal changes affecting cultural norms, individual motivations, etc. The need for regular adaptation is potentially frustrating for organizations seeking to motivate positive change with limited time and budget, but recognition of such nuances is necessary to maximize the potential for program success.

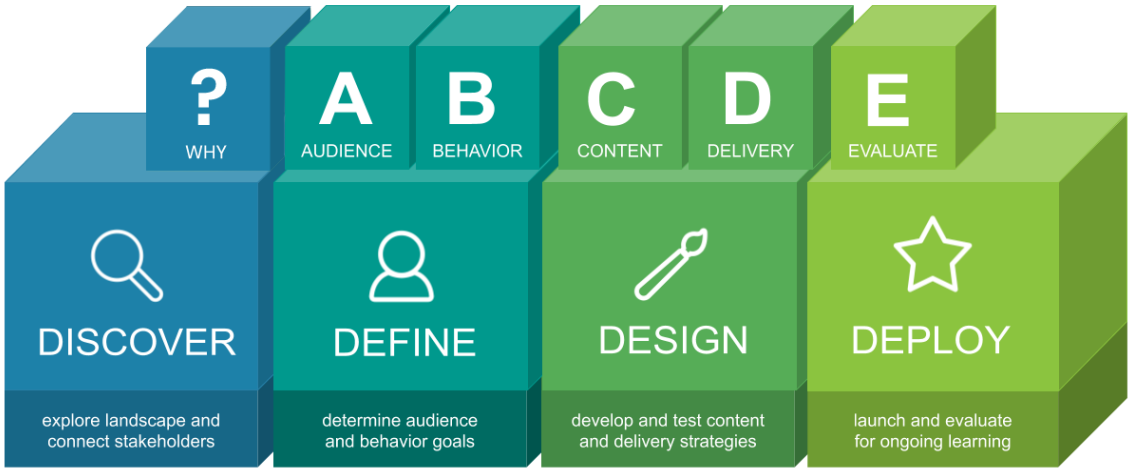
Learning from past efforts is necessary, but not sufficient, to identify new approaches. It is important to conduct research during the development, implementation and evaluation of programs to ensure all efforts are grounded in scientific theory, empirical data, and a sensitivity to the complexity of real-world application. Defining the underlying variables that make up a program (the goal, the audience and behavior they’re targeting, the content and delivery of the intervention, and the evaluation strategy) facilitates insight and systematization around the components of the program and how and for whom it works. We conceptualize behavior change not as a list of concepts or strategies, but as a process with clearly identified steps.

Goal of this Paper

This paper presents a transdisciplinary, data-driven approach for designing effective behavior change programs. In the sections below, we introduce the process and walk through each step, presenting a rationale, key outcome, and the primary activities included in each step.

[5] Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions. *Health Education & Behavior*, *39*(3), 364-372.
[6] Larson, L. R., Stedman, R. C., Cooper, C. B., & Decker, D. J. (2015). Understanding the multi-dimensional structure of pro-environmental behavior. *Journal of Environmental Psychology*, *43*, 112-124.

Building Blocks Overview



The figure above depicts the “Building Blocks of Behavior Change” process. The four large foundational blocks - Discover, Define, Design, and Deploy - are sequential steps in the process and the smaller blocks above represent the key outcomes considered during the process.

While the best possible program is one that proceeds through every stage of the process, we recognize that varying organizations may be at different stages in their journey, and may have differing levels of capacity to engage with various parts of our process. As such, each step in this process is described below in such a way that they may describe either steps in this overall process or individual research approaches that can be taken in a behavior change program.

Phase 1: Discover

Rationale

One of the most common pitfalls in behavior change is brainstorming solutions *before* identifying and clarifying shared goals, defining what success would look like, and learning from past efforts. A key first step in program development is assessing what is already known and establishing a common understanding of the problem being addressed. Achieving this requires identifying and analyzing related past efforts, engaging and aligning key stakeholders, and assessing operational capacity. Organizations (individual, cross-sector collaborations, etc.) often approach behavior change programs with multiple interests and motivations. Failing to align stakeholders early in the process can negatively impact a program’s effectiveness.

Key Outcome

Parties Aligned on the “Why”

Ensuring that the research team is aligned with key stakeholders, assessing all pertinent background information, and holding explicit conversations about the goals of the program are an essential foundation on which to build a program.

Activities

Project discovery requires careful planning and tailoring to the unique context of the program. Aligning food justice activists may require a different approach than working with program managers at an electric utility. Below, we outline key activities involved in the Discover phase.

Conduct a Landscape Assessment

Conducting a review of industry, organizational, and academic insights on similar programs or interventions helps identify what has been tried, what has (or hasn't) worked, and what obstacles or challenges have come up. We refer to this comprehensive approach broadly as a "Landscape Assessment," although the exact nature of this review depends heavily on the organizational and programmatic context.

Engage Stakeholders

Stakeholder engagement is critical to success. Stakeholders include those who: 1) are partners in delivery, 2) can inject new ideas, 3) help identify risks, and/or 4) determine program success or failure. Effective engagement with such stakeholders enables program designers to leverage expertise, experience, and knowledge, and socialize the program both within and outside of the organization. Stakeholder identification and engagement may occur in a variety of ways – from desk research to open meetings and listening sessions to snowball sampling where identified stakeholders are asked to identify other relevant parties to contribute to the research process.

Align Stakeholders on Program Goals

One of the chief purposes of engaging stakeholders early is to ensure there is alignment on the ultimate program goals. These goals are the quintessential "Why" of the program. Having a clear set of goals is vital for each subsequent building block in the process. Furthermore, identifying goals upfront will facilitate the development of a program evaluation process, and enable the research team to ensure activities proposed in the Define, Design and Deploy phases ultimately align with a logic model to guide program monitoring. Methods utilized range from informal conversations and group presentations, to formal qualitative research approaches such as semi-structured interviews, focus groups, or the Delphi method.[7,8]

Assess Operational Readiness

It is important to determine whether an organization currently has the resources required to implement a program to achieve their desired goals. This requires performing assessments of information infrastructure (e.g., can we access appropriate data, and how it is being stored?), staff capacity (e.g., do staff have the skills necessary to support the program), and cooperative capacity (e.g., is there a healthy work environment with open lines of communication?). This type of assessment is performed on an as-needed basis, and involves meetings between staff and researchers (e.g., data scientists coordinating with data managers on infrastructure).

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[7] Community Tool Box. (2001). Identifying community assets and resources. Retrieved from http://ctb.ku.edu/tools/en/sub_section_ main_1043.htm

[8] Helmer, O. (1967). *Analysis of the future: The Delphi method*. Rand Corp. Santa Monica, CA.

Phase 2: Define

Rationale

Clarifying program goals in the Discover phase provides a clear foundation for identifying which behavior(s) need to be addressed and for whom. The purpose of the Define phase is to observe and understand key audience(s), their unique decision contexts, and the complexity of their behavior, without preconceptions. Conducting research to define and understand behaviors, motivations, and barriers (psychological, economic, or otherwise) is critical. Once target audience(s) and behavior(s) are clearly defined, strategies can be incorporated and synthesized to derive a theoretically-nuanced, data-driven knowledge base to inform subsequent efforts.

Key Outcome(s)

At the end of the Define phase, you will have audience profiles and defined behavioral goals.

Audience Profile(s)

Behavioral strategies and interventions can have different effects depending on the individual or group being targeted. Defining the audience helps ensure that programs reach the right people, in the right way. This helps to better understand what audience barriers and benefits are most important to focus on in the program, and ensures that programming is sensitive to unique audience needs. In many cases, tailoring slightly different interventions to different audiences can produce a stronger impact than trying to apply the same intervention to everyone.[9] This is particularly the case for more vulnerable or "hard-to-reach" audiences, which may require different methods in areas ranging from recruitment strategy to program design.[10]

Clearly Defined Behavioral Goals

Precisely defining the behavior(s) of interest enables the development of programs that match behavioral strategies to the context and goals. As with audiences, behaviors themselves must be understood through the lenses of motivations, barriers, and benefits.[11,12] Defining these behaviors and understanding them in more detail enables the integrative mapping of audiences and behaviors as the foundation for intervention development. Consideration of the impact of the behavior ensures that the program meaningfully addresses it's core "Why".

Activities

This phase may include any of the following activities, depending on the program domain and existing research guidance.

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[9] Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology*, *27*(4), 265-276.

[10] Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., ... & Hughes, C. (2014). Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research Methodology*, *14*(1), 1-29.

[11] Longino, H. E. (2013). Defining Behavior. In *Studying Human Behavior* (pp. 151-178). University of Chicago Press.

[12] Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences*, *106*(44), 18452-18456.

Mine Existing Datasets for Patterns

Analysis of existing public databases (e.g., public opinion polls) or other internal data from past work can be examined for insights for program development. For example, in ongoing work on launching local energy providers, our team has analyzed millions of data points on customer behaviors and are using these insights to understand how various features influence program opt-out. Existing datasets can also inform assessments of behavioral impact, including existing market penetration of potential behaviors and their relative impact.

Conduct Market Research

Soliciting input from target audiences is critical to understand demographic characteristics, awareness, attitudes, and behaviors. Use qualitative approaches (e.g., focus groups, interviews) to generate hypotheses, identify pain points, and uncover deep insights on values and beliefs. Use quantitative approaches (e.g., surveys, discrete choice experiments) to test hypotheses, identify overall trends, uncover audience segments, and pinpoint opportunities for intervention. Clustering algorithms and segmentation models can identify audience segments with different patterns of awareness, attitudes, or behaviors, enabling a precise audience definition and pinpointing critical segments that could benefit from additional outreach or intervention.

Create a Journey and Decision Map

Most behaviors have multiple steps or decision points. For example, a home retrofit requires a number of phases including initial awareness, eligibility, participation decision, paperwork, scheduling, installation, and equipment use. Journey and decision mapping creates a visual map of the process, linking the end-user with the different touchpoints and decisions they face. By breaking down a program into its smallest components and mapping critical barriers, we can generate hypotheses about the areas in a program where intervention may be most effective.

Create a Behavior Inventory

In certain contexts, there are a large number of potential behaviors that contribute to the program goal. For example, energy saving behaviors encompass a broad range of distinct behaviors with different levels of existing frequency, difficulty, cost, and impact.[13] A behavior inventory draws on existing primary and secondary research to create a comprehensive matrix of the behaviors and critical behavioral dimensions, giving a quantitative or qualitative rating for each behavior along each dimension. Creating a behavior inventory allows the researchers to systematically select one or more target behaviors that have a meaningful impact on the outcome, low rates of existing performance, and/or high behavioral plasticity (or likelihood of change) in the target audience.[14] A behavioral inventory also facilitates understanding the complexities of each behavior and pinpointing important considerations (e.g., motivational, financial, technological) for developing interventions to target each desired behavior.

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[13] Karlin, B., Davis, N., Sanguinetti, A., Gamble, K., Kirkby, D., & Stokols, D. (2014). Dimensions of conservation: Exploring differences among energy behaviors. *Environment and Behavior*, 46(4), 423–452.

[14] McKenzie-Mohr, D. (1999). *Fostering sustainable behavior: An introduction to community-based social marketing*. New Society Publishers.

Phase 3: Design

Rationale

The goal of the Design phase is to craft and deliver content that engages its intended audience. Although research has defined and examined the effectiveness of these behavioral strategies,[15, 16,17] less attention has been paid to understanding when each strategy will be most effective, and how they should be combined.[18,19] Identifying when to use a given strategy is a key challenge of program design.[20,21] Delivery is also critical to program success; even the most carefully designed message is unlikely to succeed if it is delivered at an inconvenient time, by a messenger that the audience doesn't trust, or through an inappropriate communication channel.

As such, a key aspect of the Design phase involves iterative pretesting and revision of content and delivery strategies. This pretesting leverages one of the most valuable contributions of a human-centered design approach, the ability to "fail fast". Both content and delivery strategies can be developed and refined using an iterative, data-driven process coupling behavioral theory with real world insights, optimizing the program design prior to deployment.

Key Outcomes

Optimized Content

Content refers to the behavioral science strategies and message framing used in the intervention. Thinking critically about the engagement strategies that can be used in the intervention will help ensure that the best strategy is selected for the target audience and addresses their benefits and barriers.

Delivery Strategy and Plan

Delivery refers to the way that a program is distributed to the audience. Variables within delivery that can impact program effectiveness include: frequency, duration, timing, medium, and messenger. Even evidence-based interventions can fail if their delivery isn't well-designed.

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[15] Mazur-Stommen, S., & Farley, K. (2013). *ACEEE Field Guide to Utility-Run Behavior Programs* (December; p. 43). American Council for an Energy Efficient Economy. http://aceee.org/research-report/b132

[16] Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... & Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine*, *46*(1), 81-95.

[17] Chatzigeorgiou, I. M., & Andreou, G. T. (2021). A systematic review on feedback research for residential energy behavior change through mobile and web interfaces. *Renewable and Sustainable Energy Reviews*, 135, 110187.

[18] McKenzie-Mohr, D., & Schultz, P. W. (2014). Choosing Effective Behavior Change Tools. *Social Marketing Quarterly*, *20*(1), 35–46.

[19] Bohlen, L. C., Michie, S., de Bruin, M., Rothman, A. J., Kelly, M. P., Groarke, H. N., ... & Johnston, M. (2020). Do Combinations of Behavior Change Techniques That Occur Frequently in Interventions Reflect Underlying Theory?. *Annals of Behavioral Medicine*, *54*(11), 827-842.

[20] Dougherty, A., Henderson, C., Dwelley, A., & Jayaraman, M. (2015). *Energy efficiency behavioral programs: Literature review, benchmarking analysis, and evaluation guidelines*. Minnesota Department of Commerce: Division of Energy Resources.

[21] Michie, S., West, R., Sheals, K., & Godinho, C. A. (2018). Evaluating the effectiveness of behavior change techniques in health-related behavior: a scoping review of methods used. *Translational Behavioral Medicine*, *8*(2), 212-224.

Activities

The Design phase may incorporate any or all the activities described below.

Conduct a Behavioral Audit

A behavioral audit examines communications materials through the lens of behavioral science and identifies variables for testing and recommendations for improvement. Program materials to audit may include websites, media ads, flyers, applications, IVR scripts, or any other visual communications material and can include existing program materials and/or materials of other programs that have targeted similar behaviors and audiences. The audit provides specific recommendations for messaging design and delivery based on behavioral science theory.

Develop Program Strategy and Materials

Select behavior change strategies that overcome the critical barriers and leverage the motivations and opportunities identified in the Define phase. In tandem with identifying the behavior change strategy (what), you must also define its delivery mechanism, including, the timing (when), the medium (how), and the messenger (by whom). Defining each of these program variables requires a knowledge of behavioral theory and a literature review. There are likely multiple strategies that may overcome identified barriers. At this point, develop multiple hypotheses about critical barriers, motivations, and the strategies that address them. Develop program materials based on the strategies identified. Iterate material development and testing; develop draft materials and mockups to pretest strategies, delivery, and message presentation.

Conduct Testing

As noted above, identifying the right strategy and message is a key challenge of program design. Pretesting can test specific variables (e.g., message content, design, incentive amount, imagery, branding, etc.) to help move program design from guessing to best practices. There are two types of testing: UX (usability) and AB (experimental). UX testing includes methods such as eye-tracking, think-alouds, and focus groups to solicit qualitative feedback on the subjective experience of the program through in-depth review by users. AB testing involves randomly assigning participants to see different versions of program content and comparing their responses, thus overcoming limitations in the reliability of self-reported feedback.[22]

Optimize Program Based on Findings

Once program strategies and messages have been optimized through testing, finalize the design of all materials. If multiple candidate strategies for one or more program variables remain after pretesting, consider incorporating experimental or quasi-experimental design (see the deploy phase) to continue to optimize the program design. You may need to design multiple versions of the materials for field testing.

[22] Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, *34*(7), 913–923.

Phase 4: Deploy

Rationale

The Deploy phase encompasses program implementation and evaluation. Evaluation is critical to determine not only *whether* a program worked but *how* and *for whom* it worked best. Although this phase appears as the final step, successful implementation and evaluation stem directly from the "Why" in Discover, and implementation resources will constrain program development throughout Define and Design. In order to optimize resources, an evaluation plan should be developed concurrently with the program.

Key Outcomes

At the end of the Deploy phase you will have evaluated the implemented program's success.

Evaluation Plan and Report

During the Deploy phase the program is implemented, but the most important outcome for the program designer is the evaluation report. Based on a measurement and evaluation plan to measure program outcomes, the evaluation report synthesizes findings on the program impacts and documents how and for whom the program worked. It allows for further program improvement and scaling, as well as facilitating information sharing for other program designers. Funders typically require a report to document project outcomes, which can be disseminated to their stakeholders and other audiences as well.

Activities

Determine Evaluation Goals

There are several types of evaluation, each with their own goals. The most common types of evaluation are formative, process, outcome and impact.[23,24]

- **Formative evaluations** are conducted to assess the feasibility of a program (new or program adaptation) and give insight into program acceptability among the audience, resource requirements (e.g., staff, budget, space), etc.
- **Process evaluations** serve to evaluate the effectiveness of a program's content (e.g., activities) and its delivery, and the mechanisms by which the program influenced behavior (i.e., how the program influenced behavior).
- **Outcome evaluations** assess the degree to which the program met its shorter-term, more immediate effects on behaviors.
- **Impact evaluations** assess a program's longer-term (e.g, 1 year) effects on behaviors, such as decreases in electricity usage.

Utilizing various evaluation strategies can help policy administrators understand program feasibility (formative), whether the program was effective (outcome, impact evaluation), and how or why it was effective (process) in order to improve the program for future implementation.

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[23] Owen, J. M. (2020). Program evaluation: Forms and approaches. Routledge
[24] Centers for Disease Control and Prevention. (N.D.) Types of Evaluation. Accessed on May 23, 2021 from https://www.cdc.gov/std/Program/pupestd/Types%20of%20Evaluation.pdf

Identify Key Performance Indicators

In order to deliver an evaluable program, it is important to establish key performance indicators (KPIs) at the outset and have consensus among stakeholders about how they will be measured. These can be grouped into leading and lagging indicators. Leading indicators (e.g., call volume, complaints, survey data) predict future performance. Lagging indicators (e.g., energy usage) summarize past performance. Both leading *and* lagging indicators should be tracked, but often only the latter is emphasized. By conceptualizing evaluation as an ongoing process early on and regularly monitoring leading indicators, intervention designers will receive feedback and have the opportunity to modify program strategy in time to affect lagging indicators.

Develop an Implementation and Evaluation Plan

Planning for program implementation and evaluation simultaneously ensures that the right data are collected to report on impact and inform future program iterations. Exemplary questions to consider in an implementation plan include:

- What are the program activities and sub-activities that need to take place?
- What resources (money, staff time) are required to carry out the activities?
- When are key activities and milestones taking place?
- Do other partners have subject matter expertise or other competencies that we need?
- Who will take lead on specialized areas such as communications, design, marketing, evaluation, data science, behavior science, etc.?

An evaluation plan will allow for an understanding and awareness of attitudes and behaviors of program audience and stakeholders, and identify key successes and pain points of the program. Efforts should be taken to minimize threats to validity and include any limitations in evaluation reporting such that findings can be interpreted clearly and comprehensively.[25,26]

Launch and Monitor Program

Once a program implementation and evaluation plan are in place, it is time to launch. To prepare for a launch, the team needs to be trained on all protocols and processes that have been put in place to ensure that everything runs smoothly. If things don't run smoothly, then there needs to be a process in place to address problems. How are these problems identified? Throughout the duration of the program there should be program monitoring to ensure that implementation is proceeding smoothly and goals and timelines are being met. With the advent of technology and access to real-time data, there is an opportunity to track and monitor data concurrent with program deployment. This data can even inform mid-program course corrections, if needed and accounted for in the planning process.

[25] State and Local Energy Efficiency Action Network. (2012). *Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations* (No. 1219686). LBNL.
[26] Dougherty, A., Henderson, C., Dwelley, A., & Jayaraman, M. (2015). *Energy Efficiency Behavioral Programs: Literature Review, Benchmarking Analysis, and Evaluation Guidelines.* Minnesota Department of Commerce.

Evaluate for Outcomes and Improvement
Conduct planned evaluation activities. Depending on the scale of the evaluation, these activities can include analysis of program data (such as utility bills or participation rates), primary monitoring (such as direct metering of new equipment energy use), and qualitative or quantitative research with program actors such as implementers, installers, participants, partial participants, or nonparticipants. These activities can be conducted concurrently with or following the conclusion of the program.

Report on Outcomes and Opportunities
Finally, create a report that summarizes outcomes and presents opportunities. Review guidance documents to ensure that you report outcomes appropriately. There are variations across reporting requirements, (e.g., directive to include recommendations or lessons learned), formats, (e.g., executive summary, final report, memo, brief, presentation, etc). Additionally, work with your team to share findings with key internal and external stakeholders and audiences. Consider creating a dissemination plan that takes into consideration the various audiences and outlets they access to share outcomes of the program. If possible, work with a designer to think about the best way to communicate effectively with each audience so that messages can get across clearly as well.

Conclusion

Behavior change programming is complex and multifaceted. When contemplating the diversity of humans and their environments, it isn't surprising that efforts to change behavior require careful attention. In this paper, we've provided a general overview of our transdisciplinary approach to behavioral program design. We view behavior change programming as a scientific, mixed methods process involving a series of complementary building blocks which sequentially flow from program inception to evaluation. By attending to each building block in detail and applying a scientific approach throughout the process, opportunities for program success are amplified, thus maximizing the potential to promote positive behavior change.