SUMMARY:

Criteria for Behavior Change Interventions

Summary of:

Behavior Change Interventions in Practice:

A synthesis of criteria, approaches, case studies & indicators

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Introduction

Through our review of case studies, design frameworks, and indicator development for behavior change in this report and overall best practices in behavior change design, we identified a series of criteria for behavior change programming. These were selected to identify program design features that achieve effective, sustained behavior change in the environmental space. While many of these criteria do involve the incorporation of social and behavioral science, they are also strongly informed by the practical experience of designers for creating tailored behavior change solutions.

These criteria fall into three broad categories:

Behavioral context analysis criteria refer to establishing a clear understanding of the overall socio-ecological system that behavior is embedded in, a clear definition of the target behaviors and actors, and the motivations and barriers of those target actors.

Intervention development criteria refer to building insights developed in that behavioral context analysis into a socially and psychologically informed solution likely to achieve effective behavior change.

Monitoring and evaluation criteria include creating a framework that allows for the generation of applicable and generalizable data for decision making that moves beyond simply measuring program inputs and outcomes to the psychological and social states of the actors involved.

These criteria are summarized as follows:

- Identify clear and specific behavior-actor pairs
- Conduct contextual analysis to understand the socio-ecological system in which the ac-tor and behavior is embedded
- Conduct analysis of the target actors' needs and experiences to identify motivations and barriers
- Engage a range of relevant stakeholders throughout different scales of roles
- Base the design of the intervention on a psycho-social theory of change, linking intervention components to psychological or social changes, leading to behavioral outputs and environmental and social outcomes
- Incorporate the motivations and barriers of a diverse set of actors at different scales sufficient for addressing the problem
- Rather than relying on a single behavioral insight, draw on multiple psychological and social principles to address the various barriers and motivations actors throughout the system may have
- Throughout the intervention development process, encourage the development of intervention prototypes, and test those prototypes with the target actors prior to scaled implementation
- Monitor and evaluate the intervention not just against environmental outcomes, but also behavioral, psychological, and social outputs
- Evaluate the program against a valid counterfactual to determine the causal effect of the intervention
- Continue evaluation beyond the cessation of the program to ensure that the environmental outcomes, as well as the psychological and social outputs, are sufficiently durable

Criteria

Criteria for Behavioral Context Analysis

Developing an understanding of what behaviors need to be taken by which actors, what socio-ecological context those actors inhabit, and what barriers and motivations they may have.

Identify clear and specific behavior-actor pairs

Programs that aim to change behavior need to identify the precise actions they wish to be taken, and the specific target actors they wish to take that action. These are known as behavior-actor pairs. This is distinct from programs that may aim to, for example, change attitudes or beliefs without a clear hypothesis as to why changing those attitudes or beliefs will result in the change of a target behavior. It can also be contrasted with programs that aim to change an amorphous set of behaviors, such as "encouraging climate-smart agriculture," without a clear set of specific actions.

Being specific about which actors designers aim to influence is also critical. For example, a campaign might aim to increase the use of composting in a farming community. While this campaign may be occurring in a single community, it is likely not trying to change the behavior of all community members. In fact, the campaign may only be targeting a particular subset of community members, such as farmers. This is not to say that other members are not important for achieving this behavioral outcome, but it explicitly recognizes that their role, and therefore the target behavioral outcome, is different. For example, the children of farmers might be significant influences on their parents. Therefore, children might be target actors for the behavior of telling their parents how important it is to compost, despite them not being the direct actor themselves. In this way, it is important to identify not only the direct behavior-actor pair that is closest to the tar-get outcome, but also all the indirect pairs that create an enabling environment throughout the social system.

Identifying behavior-actor pairs allows for precisely targeted programming. These pairs should serve as the target actors and behaviors for any intervention component, as well as guiding whether a particular component should be included in an intervention or should be revised. Only components that are expected to drive an actor to adopt their target behavior should be incorporated. For examples of where behavior-actor pairs facilitated better programming, see the Brazil and Indonesia case studies in Part II, as well as the Part I for information on how different design frameworks approach this from a practical standpoint.

Conduct contextual analysis to understand the socio-ecological system in which the actor and behavior is embedded

The actors we aim to influence do not exist in a vacuum. Their ability, as well as their interest in taking a target action, is not determined simply by their own mental processes: it is just as significantly determined by the wider cultural context that enables and limits these actors' actions. An understanding of this wider cultural context goes beyond generalities of how a group acts or what they believe. It involves identifying the systems of power, institutions, and structural forces that shape actors' identities and social roles. This has implications for constructions of gender, race and ethnicity, socioeconomic status (SES), and religious affiliation—and that, in a given context.

The program designer will need to determine which actor's identities are, in fact, relevant in enabling or limiting the actors from performing their target action. It is important not to essentialize individuals as being a part of one group or another. In fact, very few of these identities are mutually exclusive, meaning that individuals exist as an intersection of those differing dimensions. Those intersections may present different abilities and limitations than the identities themselves. For example, while women and all ethnic groups, independently, may be allowed to participate in a meeting, women of a particular ethnicity (i.e., the intersection of gender and ethnicity) may be excluded.

Understanding the socio-ecological system also involves careful examination of the relational dynamics between the implementer of an intervention and the various actors in the behavioral system. For example, while participating in an intervention may be perceived by the implementer as voluntary, the actor may perceive the implementer as in a relative position of power. This can make compliance feel required from the perspective of the actor. It is similarly critical to under-stand the trust dynamics that are present both within a community of actors as well as between that community and program implementers.

It is not possible to identify an exhaustive list of all of the elements of a socio-ecological system that may be relevant for any intervention. Rather, the relevant factors are intervention and context-dependent. Program developers should employ social science data collection tools, including interviews, surveys, focus groups, and observation, to determine what social factors may limit or enable actors. These socio-ecological factors will be critical to intervention development, both to understand how to best promote action given that unique system as a constraint, as well as leverage elements of that system to promote program effectiveness.

Some additional tools for understanding the behavioral system are from the field of systems thinking. Concept modeling and systems mapping are tools that help designers to draw the links between elements in a system and labeling the enabling, reinforcing, and restricting forces among them. Stakeholder mapping focuses specifically on the relationships between actors in the same context relative to a behavior. These tools are useful in plotting important actors, behaviors, and contextual factors all in one place as a reference for creating later interventions.

Conduct analysis of the target actors' goals and experiences to identify motivations and barriers

Beyond elements identified in the socio-ecological analysis, understanding the experiences of the target actors, as well as their self-identified—rather than designer assumed—needs, allows for a program designer to identify motivations and barriers for an actor to adopt a target behavior. Starting with an analysis of past experiences can reveal why an actor might have tried, whether successfully or not, to engage in the target behavior. This can demonstrate both the needs that led them to attempt the behavior and highlight the barriers that prevented them from achieving that goal.

Analyzing their past experience can reveal what might be effective for motivating an individual to act, and what barriers may prevent them from doing so. In a context where some people are en-gaging in the target behavior and some are not, it can be useful to compare what differentiates those 'doers' and 'non-doers. This analysis can reveal possible socio-structural limitations on actions such as discussed above, as well as the individual-level motivations or barriers leading some to act while others did not. The intervention designer can then use this intervention to most effectively promote the target behavior in the target actor's own terms, rather than those assumed by an outside group. Motivations and barriers can often be identified through surveys, interviews, behavioral journey mapping, and other data collection techniques. Case studies in Indonesia and Namibia in Part II of this report present strong examples of the value of identifying these motivations and barriers, while Part I gives additional information on how different behavioral change frameworks approach collecting this data.

Engage a range of relevant stakeholders at different scales of the behavioral system

Identifying and engaging relevant stakeholders is important for both an effectively designed intervention as well as building stakeholder support. Identifying what makes a stakeholder relevant is context-dependent. However, it is important to note that relevance does not simply mean those in positions of power or authority. In fact, those in positions of power often have both interests and beliefs that differ from those who are most affected by an intervention. Relevance, therefore, entails representation from across the behavioral system, with a particular emphasis on actors represented in the various direct and indirect actor-behavior pairs designers previously identified. Similarly, interventions often provide costs and benefits unequally; it is critical to incorporate not only those who might benefit from an intervention, but also those who bear its costs. This means ensuring that the various identities who may interact with the intervention are represented. This could include representation across

gender, ethnicity, and SES, but also a host of other social differences identified in implementers' analysis of the socio-ecological system.

It is important to note that engaging stakeholders does not simply mean cursory consultation or the provision of information. Instead, engagement should be seen as a consistent and sustained dialogue—as opposed to simply presenting a pre-established intervention to stakeholders for approval. Stakeholder dialogue should instead be sustained throughout the intervention design process so that stakeholders' perspectives and insights are incorporated into an understanding of the behavioral and social contexts during the intervention's development.

Criteria for Intervention Development

Building an effective behavior change intervention which is firmly grounded in the insights developed in the behavioral context mapping to specifically target the barriers and motivations of tar-get actors with psychologically and socially informed strategies

Base the design of the intervention on a psycho-social theory of change: link intervention components to psychological or social changes, behavioral outputs, and environmental and social outcomes

In order to develop an effective yet streamlined intervention, it is important for that intervention to focus specifically on those changes necessary to bring about the desired behavioral shift. Framing the intervention as part of a cohesive Psycho-Social Theory of Change (PS-ToC) allows for a highly precise intervention, focusing only on those elements that are required to bring about a change in behavior.

A ToC traditionally expresses the logic of an intervention by showing which intervention components are expected to achieve what intermediate outputs, and how those intermediate outputs are expected to affect program outcomes. However, these intervention components almost never directly lead to an intermediate output, like a behavior. Instead, they work by changing the psychological or social state of the actor, which then allows for, or motivates, that actor to adopt the behavior. These changes to psychological and social states are the critical glue linking together intervention components and behavioral outputs, but they are critically lacking from traditional ToCs. A PS-ToC draws on the findings of preliminary behavioral context mapping, and includes the explicit representation of the ways in which any given component of an intervention is expected to change the psychological or social state of a target actor (or actors)—this should then lead to an intermediate behavioral outcome. A PS-ToC also includes the explicit acknowledgment of the enabling social context that is (or will be) necessary for an intervention to be effective.

Building a behavior change program out of a PS-ToC presents a number of key benefits over a traditional ToC. First, it ensures that all intervention components are explicitly linked to insights gleaned from the behavioral context analysis rather than relying on the intuitions of a program designer. Second, it allows for each component of the intervention to be objectively evaluated relative its efficacy in changing the target psychological or social state(s), and to identify any extraneous elements in an intervention that would have no effect (direct or otherwise) on the aforementioned social and psychological states.

For more details on the components of a PS-ToC and an example from increasing reserve compliance in coastal fisheries, please refer to the Psycho-Social Theory of Change section of Part III of this report.

Incorporate the motivations and barriers of a diverse set of actors at different scales sufficient for addressing the problem

In the framing of the behavioral context, designers will likely have identified a variety of actor-behavior pairs through techniques such as systems mapping, interviews, and other qualitative data gathering techniques. And looking at each of those actor-behavior pairs, designers will have identified the various identities held by the actors that correlate with different motivations and capacities. Now that designers are developing the intervention, it is critical that they incorporate a nuanced understanding of various identities and social positions. This avoids the risk of designing an intervention fit only for the motivations and capacities within the socio-ecological system of those most prominent. Instead, an effective intervention is one designed to address the diverse needs of different actors with different identities, doing so for all the relevant actor-behavior pair.

Similarly, it is important for an intervention to address the various actor-behavior pairs across various scales, rather than focusing solely on those actors whose actions directly contribute to the program outcome. It is just as critical to ensure that programming targets those actor-behavior pairs that create the necessary enabling conditions that motivate actors to take action. One can aid in the creation of an enabling environment by providing material support or by building social capacity; think someone in a position of power or prestige allowing and encouraging someone of a different social standing to take action. The case study in Namibia presents a clear example of design that takes account of the diverse needs of different identities within a given actor-behavior pair. The case studies in Indonesia, Mexico, and Colombia (specifically Bogota), highlight how design aimed at changing the behavior of those that need create the enabling environment is critical for change too. All of the above can be found in Part II of this report.

Rather than relying on a single behavioral insight, draw on multiple psychological and social principles to address actors' various barriers and motivations.

Applying behavioral insights to a given behavior change challenge involves connecting the findings from the behavioral context analysis to principles documented in the behavioral and social sciences as being important enablers and drivers of behavior. This can be contrasted with the common practice of relying on the designer's intuition for what might drive behavior change in a particular context. This also does not mean applying the same principles in every context. Rather, it means identifying which principle is applicable given the behavioral context analysis. For more information on engaging in this process, please refer to Part I of this report, which includes information on how various frameworks approach mapping behavioral and social science principles to what will change behavior. It is important to note, however, that the principles in those frameworks far more frequently drawn from the behavioral rather than social sciences. This is not to suggest that social science principles are not applicable, but behavioral science attempts to identify domain-general principles, whereas the social sciences tend to focus on how different contexts make different intervention features more or less relevant. Within a given context, how-ever, the social sciences often provide specific applicable principles. For example, if a designer is facing a common pool resource problem, Ostrom's eight Design Principles for Common Pool Resource Institutions would be particularly relevant. Once a program designer has identified their area of intervention, they should then identify which social science principles correspond to that specific domain.

At this stage, many programs make the mistake of focusing on a single behavioral or socio-ecological insight. This myopic focus provides a single point of program failure, as well as fails to recognize the differing social positions actors, their individual differences in motivation, and the fact that even a single actor often faces multiple distinct barriers and motivations which making a behavioral choice.

There can be different barriers and motivations within a given actor-behavior pair (e.g., farmers using compost). For example, the social structure could mean that male farmers have greater authority in managing waste for composting. This insight might lead an intervention designer to conduct additional programming to change the social dynamic of women's authority in this con-text to afford them the ability to choose whether to compost in their field. At an individual level, behavioral context analysis may also show that aversion to ambiguity is a major barrier

to adopting this novel practice. A program that only addresses the social-structural insight of gender differences or only addresses the psychological insight of aversion to ambiguity is likely to be insufficient to tackle this challenge. Instead, effective programs knit together a web of behavioral and socio-ecological insights to motivate each element of the intervention.

The context will determine what behavioral and social science insights to incorporate. The case studies in Indonesia and Mexico compellingly integrate a suite of psychological and socio-behavioral insights to develop improved behavior change programming.

Throughout the intervention development process, encourage prototyping interventions, and test those prototypes with the target actors prior to scaling implementation.

While developing an intervention based on an empirically supported psycho-social theory of change is far more likely to render an effective behavior change intervention, it is impossible to perfectly forecast exactly how actors will engage with each intervention component. This means it is critical to test those intervention components with the target actors in order to reduce the possibility of deploying an intervention at scale that then later proves to be ineffective. There are various scales at which this testing can occur: from presenting prototypes (small scale versions, generally at a far lower cost and effort) of intervention components and getting direct feedback in something like a focus group, all the way to fully piloting interventions in target communities be-fore finalizing them for deployment at scale. Where on this spectrum testing falls should depend on the confidence designers have in the effectiveness of a particular component in the target context and the costs of an intervention not being successful by not pursuing more extensive testing. Testing and revising imply that intervention development is necessarily non-linear. Instead, testing and intervention development represent an iterative process—each feeding into the other until the intervention is ready to be launched at scale.

Testing can sometimes be perceived as a costly or risky step in the intervention development process, but it is far more often net cost saving. While testing adds direct costs, it allows a designer to avoid the far more costly error of implementing an unsuccessful intervention. Similarly, while a test may fail in the sense that it shows that a particular component is unlikely to achieve its desired result, this type of failure massively reduces the risk of a large-scale failure if that component was taken to scale.

For more information on testing, designers may wish to refer to the World Bank and Rare frame-works in Part I of this report. The case studies in Kenya and Brazil also present clear demonstrations of how testing intervention prototypes can dramatically improve program effectiveness. The water crisis case study in Colombia, however, gives a cautionary perspective on how a lack of adequate testing may result in significant costs or delayed action.

Criteria for Monitoring and Evaluation

Building a monitoring and evaluation framework for behavior change interventions that can generate actionable information for live program decisions, accurate evaluation, adaptive management, and understanding program generalizability.

Monitor and evaluate the intervention not just against environmental outcomes, but also behavioral, psychological, and social outputs

Selecting indicators to monitor should be derived from a program's ToC. Incorporating psycho-logical and social states into the PS-ToC allows for these indicators to be incorporated into pro-gram monitoring and evaluation. Monitoring these psychological and social states allows for a program designer to assess the effectiveness of the various component mechanisms for change as well as behavioral measures and intended environmental outcomes. This allows designers to take a more nuanced approach to adaptive management, and to improve on future program development.

While assessing psychological and social indicators can be important for assessing the effectiveness of intervention elements in achieving intermediate outputs, they can also be important program outcomes in and of themselves. Many programs assume that achieving environmental outcomes will naturally lead to positive social outcomes for affected communities. However, there are numerous documented cases where positive social outcomes failed to materialize, or worse, where interventions resulted in harm to the communities that rely on the environmental resources that were targeted. In cases where interventions may affect the social welfare of a community—occurring in the large majority of community-based behavior change programs—social outcomes need to be evaluated with the same attention and rigor as environmental outcomes.

Collecting monitoring data on psycho-social intermediate states and outcome indicators provides unique data for decision making in monitoring, evaluation, and generalization. Monitoring data allows designers to more accurately assess the underlying mechanism for why a program works, which can be incorporated into adaptive management decisions over the lifecycle of a program. When collected at a high-enough frequency, these data can also be used for dynamic program-ming on a site-specific level—meaning that data feeds back into a program while it is being delivered to inform live decision making on improvements to delivery, reductions in program cost, and increases in effectiveness. Additionally, as psycho-social indicators provide insight into why a program functions, they can be used to inform the generalizability of an intervention to novel contexts, making the scaling out of a program far more likely to succeed. To find more details on these applications of psycho-social indicators, please refer to the Framework for Indicator Monitoring and Adaptive Management section of Part III of this report.

A program's PS-ToC will determine the specific behavioral, social, and psychological indicators relevant for monitoring and evaluation. However, for additional general guidance on the selection and measurement of behavioral, social, and psychological indicators, please refer to Part III of this report.

Evaluate the program against a valid counterfactual to determine the causal effect of the intervention.

Understanding whether a program achieved its desired outcomes, be those be environmental, behavioral, psychological, or social, allows future programs to learn, and effective programs to be scaled out. However, frequently program outcomes are assessed in a way that it is hard to justify any causal claim about the effect of the intervention.

Causal reasoning depends on comparing against a counterfactual, which asks, what would have happened if no intervention had taken place? Without some understanding of what the counter-factual is, there is no way to determine if a change in the value of an indicator was due to an intervention, or anything else in the behavioral or social context that might have impacted it. Randomization is a commonly-used technique for creating a counterfactual; some units, such as individuals or communities, are randomly assigned to receive an intervention, and others are not. The difference between the outcomes of these two groups can thus reasonably be understood as causal—that is, designers can be confident that it is the intervention that caused any changes they observed.

When randomization is not possible, there are various alternative techniques. These include matching and difference-in-difference, which allow for the estimation of an intervention's causal effect, though they require additional assumptions. Critically, the use of simple, pre-post comparison is nearly never sufficient for implementers to reliably estimate the effect of an intervention because many factors other than the intervention itself may have influenced the intervention's outcome indicators.

For more details on the options available for evaluation designs, including those identified here, please refer to Frameworks for Evaluating Changes in this report's Part III, Indicators section.

Continue evaluation beyond the program's end to ensure that environmental out-comes, as well as the psychological and social outputs, are sufficiently durable.

Particularly in the environmental sector, the impacts we aim to achieve often last far beyond the termination of program activities. However, for many programs, the final evaluation of that impact occurs at the time the program concludes. While this is problematic for any environmental pro-gram, it is a particular issue for behavior change programs that rely on sustained adherence to the target behavior to achieve maximum impact.

This misalignment between a program's impact and its evaluation timeline creates a perverse incentive for program designers. Programs that achieve quick but unsustainable changes in behavior are seen as relative successes, whereas those that rely on scaling deep are often seen less favorably than they deserve. For example, social norm change programming can create self-reinforcing norms, but those take significant time to achieve.

Programs should, therefore, match their evaluation timeline with the timeline of the expected impact of the program, rather than the duration of the program itself. This is often most effectively done through the use of proxy measures for key indicators that can rely on either remote or administrative data collection, making continued impact evaluation more cost-effective. Such evaluation allows for more effective data for decision-making by allowing for the entire impact of a pro-gram to be incorporated into decisions to scale the program out.

Glossary

Actors: People whose behavior directly or indirectly affects program outcomes

Adaptive management: a process of updating and improving how a program is managed based on data and feedback about what is working or not working

Attitude: An evaluation of something, ranging from negative to positive

Barriers: Forces, attitudes, beliefs, or other reasons that prevent someone from doing a behavior

Behavior: An action that a person takes in response to something (a stimuli)

Behavior-actor pair: A grouping that identifies a behavior and who is doing it

Behavioral insights: The findings that result from analyzing patterns in how people tend to behave.

Behavioral system: A network of actors, mapping how each actor's behavior influences each other's capacity to act and their interest in doing so

Behavior change approach: A methodology for changing behavior, often drawing upon principles of behavioral design

Behavioral indicator: A measurement that signifies behavior (or something that approximates it) has changed

Behavior change intervention, programming: A set or sequence of activities that aim to influence actors to adopt target behaviors to achieve a certain outcome

Behavioral design: An approach that blends insights from the design and behavioral and social science fields

Belief: Something that someone accepts to be true

Bias/Cognitive bias: A way of thinking that systematically deviates from rational choice

Control: A level of an independent variable a person or group is assigned to in a study that receives no additional intervention

Counterfactual: A comparison for an intervention to assess its impact that shows what would have happened if no intervention had taken place

Cross-context generalizability: The degree to which something applies to other socio-ecological contexts

Design thinking: A creative and iterative process for developing, designing, and testing innovative solutions, often used in combination with human-centered design

Difference-in-difference: A quasi-experimental method that compares the pre-post change (difference) in outcomes for the treatment group with the change in outcomes of a comparison group

Direct observation: Type of behavior measurement based on directly observing behavior, rather than using a proxy or self-report measurement

Disaggregation: A data reporting process that shows how an intervention may have impacted different groups differently

Doer/non-doer analysis: A comparison of the motivations and barriers for people who are already doing the target behavior and those not doing the target behavior

Durability: The degree to which an intervention's effects persist during an intervention period and after the intervention has ended

Dynamic programming: Making live programmatic decisions about phase transitions, expansion, or termination based on real-time monitoring of psychological and social states of the target actors

Human-centered design: An approach or mindset to problem-solving that centers people's needs and goals in solution designs, often combined with design thinking

Matching: A quasi-experimental method that builds a comparison group by identifying units that are similar to each of the treatment units based on a relative set of observable characteristics

Motivations: Forces, attitudes, beliefs, or other reasons that encourage someone to do a behavior

Outcomes: The behavioral, social, or other goals or objectives a program is trying to achieve

Outputs: The components of a program that help to show how it achieved its outcomes and may serve as intermediary objectives

Pre-post comparison: A study where a treatment effect is estimated by subtracting the base-line value from the value after treatment

Program activities: The parts of an intervention that are implemented to change behavior, such as training sessions, pledges, incentive mechanisms, etc.

Prototype: A small-scale version of a behavioral solution that captures its essential features and can be tested with target actors

Proxy measures: Type of behavior measurement that uses outcomes assumed to be tightly related to the target behavior

Psychological indicator: A measurement that signifies a belief, attitude, or preference (or something that approximates it) has changed

Psycho-social state: Beliefs, values, expectations, and social relations that result from program activities, and other psycho-social states and also influence future behavior

Psycho-social theory of change: A theory of change that links intervention components to psychological or social changes, leading to behavioral outputs and environmental and social out-comes

Pulse monitoring: Assessing key psycho-social indicators on a frequent basis throughout pro-gram delivery

Quasi-experimental methods: Evaluation methods that infer the causal effect of an intervention without randomization when assigning individuals to treatment conditions

Randomized evaluations, Randomized Control Trials (RCTs): Evaluation methods where individuals are randomly assigned to treatment conditions

Self-report measures: Type of behavior measurement where the rate or intensity of a behavior is inferred through responses from instruments such as surveys

Social indicator: A measurement that signifies a social state, structure, or factor (or something that approximates it) has changed

Social marketing: The application of techniques from marketing to shift behavior to benefit individuals and society

Socio-ecological system: A system of interdependent linkages between ecological factors, social and cultural factors, and institutions at different scales that continually adapt over time

Stakeholders: Individuals or groups who have an interest in environmental outcomes or will be affected by a project and program

Study condition: A level of an independent variable a person or group is assigned to in a study

Study treatment: The intervention an individual or a group receives, based on the condition to which they were assigned

Systems thinking: An approach that synthesizes how parts of a system relate to, influence, and cause one another, often through feedback loops

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