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What Tastes Like Home? Collaborative Research on an Interactive Response Wall

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Executive Summary

This research project was a collaboration of the United States Botanic Garden (USBG) and COSI's Center for Research and Evaluation (CRE). The research investigated how visitors engaged with an interactive response wall in the Cultivate: Growing Food in a Changing World exhibit, which invited visitors to leave their own answers to the question, "What tastes like home?" Building on USBG team members' observations that the response wall seemed to elicit rich personal responses, the study explored how visitors interpreted and responded to this question and how the activity contributed to feelings of inclusion within a public garden setting. Ultimately, the research aimed to identify what insights this experience might offer for designing inclusive learning environments in public gardens, as well as to demonstrate how social science research approaches can provide new perspectives on visitor engagement and learning in public gardens.

Methodology

As an intentional collaboration, all major decision-making about and operations of this project reflected the perspectives of both the COSI research team and the USBG Learning and Engagement team. Technical activities carried out by these teams included the following:

- **Development of an initial thematic framework**, informed by a literature review and an inductive analysis of sample sticky notes from the response wall
- **Development and refinement of a conceptual model**, intended to identify discrete elements of visitors' interactions with the response wall and grounded in both scholarship and onsite context
- **Data collection with visitors to USBG**
 - **Post-activity questionnaire** (completed by n=156 visitors to the response wall) to measure visitors' experience with constructs and activities described in the conceptual model
 - **Post-questionnaire interviews** (completed by n=63 questionnaire respondents) to clarify visitors' reasoning for their responses and their impressions of what supported or detracted from their experience
- **Fuzzy-set Qualitative Comparative Analysis (fsQCA)**, a strategy for exploring the data in order to identify combinations of conditions (summarized in an emergent model) that contributed to the presence or absence of a strong sense of inclusion among visitors
- **Focused discussions** with USBG staff and other colleagues in the field to contextualize findings and inform recommendations

Answers to Our Research Questions

1: Interpreting and responding to “What tastes like home?”

- As expected, visitors’ sticky note responses strongly reflected names or categories of foods, usually selected for their salience to aspects of personal identity, such as cultural heritage, life stages, individual histories, and people and places with special importance. Engagement with the response wall often involved consideration of other visitors’ responses and consciousness of potential audiences for one’s own response.
- Visitors who interacted with the response wall tended to express basic psychological need satisfaction in connection with all experience elements reflected in the research model. These feelings were necessary to experiencing inclusion but not sufficient on their own: feelings of nostalgia and uniqueness were also important contributors. Curiously, the absence of the sense of something special to say was prominent in pathways to the absence of sense of inclusion. The wall activity’s combination of the opportunity to reflect on responses from oneself and others seemed to support feelings of nostalgia and uniqueness.

2: Insights for public gardens

Although visitors rarely linked their sticky-note responses directly to their USBG visit, the study’s findings generated rich discussions among USBG staff about how application of the study’s conceptual model more generally to the Garden setting. Using the conceptual model as a guide, staff identified ways that public gardens can enhance visitors’ sense of competence, relatedness, autonomy, nostalgia, and uniqueness—key contributors to feelings of inclusion. These conversations highlighted practical touchpoints across the Garden experience, such as reducing confusion in busy areas, supporting visitors’ emotional and cognitive processing, and creating space for visitors to recognize and share personal connections with plants.

Overall, the research suggests that the conceptual model can serve as a useful tool for public garden professionals, helping them reflect on existing practices, identify areas for strengthening visitor support, and design experiences that foster inclusive, meaningful engagement.

3: Insights for inclusive learning environments

Feedback from professionals in other informal learning institutions demonstrated the conceptual model’s applicability to designing response walls more generally. Similarly to its applicability to garden settings, the model can be used to organize conversation about generating inclusive environments more generally.

Conclusions and Recommendations

The major finding of this research is that pathways to experiencing feelings of inclusion can be influenced by designing to promote visitors’ sense of competence, relatedness, and autonomy augmented with feelings of uniqueness and nostalgia and by mitigating the potential for confusion or overwhelm. In addition, design choices and invitations to

engagement that prioritize basic psychological need satisfaction are critical elements to these pathways, albeit insufficient on their own. The research team’s experiences implementing the project and making meaning of these findings also suggest some practical considerations for professionals in public gardens and informal learning settings more generally, as described below.

Takeaways for developing interactive response walls

The study findings suggest some practical tips for designing interactive response walls that can support feelings of inclusion:

- **Help people feel cared for and caring, competent, and empowered to make choices.** We recommend...
 - inviting visitors to share their perspective and identity with others
 - asking simple questions, and framing them in ways that value a person’s own knowledge and experience
 - allowing for choice wherever possible and welcoming personal expression
- **Ask questions that evoke and show respect for personal memories or experiences.** We recommend inviting people to think about something important to who they are.
- **Create an experience where everyone can feel special.** We recommend “seeding” displays with visitor responses, showcasing many different ways of responding, and inviting close looking.
- **Consider ways to support people through confusion and overwhelm.** We recommend providing concrete examples and ample emotional and physical space for reflection and processing.

Advantages of collaborative research

Through this work, USBG identified some important value propositions related to researcher-practitioner collaborations, as follows:

- Engaging the USBG team directly throughout the project enhanced the rigor of the research by bringing educators’ disciplinary knowledge bases and practical knowledge of the USBG context to scoping, planning, and implementing the study.
- Collaboration between USBG and COSI team members meant pooling resources and finding efficient ways to work across a distributed team; the result was that sharing inputs such as labor hours, hard costs, and material resources led to stronger outputs than either team could produce independently.
- Working closely throughout the project helped researchers and practitioners find strong alignment in identifying and prioritizing different ways of communicating research and maximizing the potential for research use.
- Through their participation in instrument development, data collection, data analysis, interpretation, and dissemination, practitioners across the USBG team contributed

meaningfully to a research study and experienced unique opportunities for professional learning about social science.

- USBG's involvement in this research increased opportunities to expand practitioner-led engagement in visitor studies, including studies initiated and implemented by members of the USBG team.

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Introduction

This report describes the activities undertaken under a cooperative agreement between COSI and the United States Botanic Garden (USBG). The purpose of this collaboration was for researchers from COSI and educators from USBG to work together to design and implement a study of USBG visitors' experiences engaging an interactive component of the USBG's exhibit, *Cultivate: Growing Food in a Changing World*. The specific experience the study focused on was a response wall in which visitors were invited to place sticky note answers to the question "What tastes like home?" The project described here, *What Tastes Like Home*, responded to the richness and variation in USBG visitors' responses by exploring the mechanics of how visitors encountered the prompt. The intent of the study was to gain insight into factors that inform the creation of inclusive learning settings within public gardens, and to demonstrate how social science research approaches can provide new perspectives on visitor engagement and learning in public gardens. USBG worked closely with COSI to develop and complete the study, as well as to communicate findings and lessons learned from applying a social science research lens to a public garden experience. Throughout the project, both teams aimed to identify findings and lessons learned that could be applicable for public gardens professionals engaged in the design of visitor experiences, as well as for social science researchers interested in collaboration with public gardens.

Ultimately, this research contributes to answering our overarching question: *In what ways can public garden designers best utilize the unique public garden environment to create inclusive learning settings for all?* Following Jansen et al. (2014), we measured visitors' experience of inclusion through indicators of the constructs "belonging" and "authenticity" (see *Questionnaire development*). This approach allowed our study to consider the importance of both group and individual identities and concretely explore the role of basic psychological need satisfaction in experiences of inclusion. Below, we detail the specific research questions that organized the work of our study.

Research questions

1. Within the context of the USBG's exhibit, *Cultivate: Growing Food in a Changing World*, how do people respond to the question, "What tastes like home?" and why do they respond that way?
 - a. How do people interpret the question, "What tastes like home?"
 - b. What aspects of their identities/experiences do people deem relevant to the question?
 - c. What kinds of experiences and responses emerge from this question?
 - d. What processes lead to the responses?
 - e. What contexts inform the responses (social, environmental, etc.)?
2. What might these insights mean for public gardens?
 - a. In what ways do these responses and experiences reflect unique offerings of this exhibit, the public garden experience, and perhaps public gardens more generally?
 - b. In what ways do responses provide insight into quality engagement with public garden audiences?
 - c. What can other public gardens learn from our learning?

3. What might these insights mean for creating inclusive learning environments in general?
 - a. In what ways do these experiences reflect conditions for inclusive learning environments?
 - b. What does evoking “home” do for visitors (cognitively, affectively, socially)?

Collaborative approaches to asking and answering the research questions

This research project came about as USBG personnel noticed unusually detailed and varied responses to their sticky note wall and saw an opportunity to explore the mechanics and effects of such deep engagement. To initiate the project, USBG engaged COSI’s CRE researchers to partner in a collaborative research project. The intent of this co-designed study was to gain insight into factors that can inform the creation of inclusive learning settings within public gardens, and to demonstrate how social science research approaches can provide new perspectives on visitor engagement and learning in public gardens. We have aimed from the outset to ensure that our ultimate findings and takeaways can be meaningfully applicable for public gardens professionals engaged in the design of visitor experiences, as well as for social scientists interested in strategies for supporting a sense of inclusion in settings like USBG. In light of these goals, it has been important to our process to bring the perspectives of both the COSI research team and the USBG Learning and Engagement team to real-time meaning-making and all major decision-making about the project.

As the project began, we worked together to brainstorm key topics in scholarly literature that seemed salient to understanding responses to the prompt, “What tastes like home?” and what considerations have been observed as important to supporting inclusive learning settings. We then undertook a literature scan to ensure that critical areas of inquiry would be included in our instrument design and analysis (see *Contributions from the Literature*). At the same time, the USBG team systematically photographed anonymous sticky notes left at the Garden’s response wall over a sample of seventeen days in autumn 2023 (September 22-30; October 1; October 3-5; November 22-25; and November 27). The CRE team then inductively coded these sticky notes in order to create an initial set of thematic categories that could together describe the range of ideas visitors had been leaving at the response wall. Using both the literature scan and the sample sticky notes, we created an initial coding framework to inform what kind of data we should elicit with study instruments and how we might organize analysis (see *Coding Framework*). With our combined knowledge of the direct experience at USBG and our experience developing the coding framework, we also collaborated to create a hypothesized model of what the constituent elements of visitors’ interactions with the response wall might be and how they might support an inclusive learning experience (see *Conceptual Model*). The form of the conceptual model then guided other collaborative decisions about how to gather and analyze data, which in turn informed iterative updates to our conceptual model and areas of focus within our research agenda. The report sections that follow explain major context and decision points for the information and understandings that inform our takeaways and recommendations for practitioners (see *Conclusions and Recommendations*).

As it turned out, almost as important as answering the research questions was to explore the benefits of collaborative research in this garden-based informal education setting, i.e., in what ways would the collaboration impact the research and how would the research process and results affect the garden practitioners. Although this secondary purpose for the research was not articulated up front, it became continually more important to the experience as the project progressed.

Contributions from the Literature

This project's first phase involved a deductive/inductive study of existing sticky note responses to the “What tastes like home?” prompt. To help us base our initial deductive coding scheme for categorizing the responses on a strong theoretical foundation, we conducted a targeted scan of the literature. Specifically, we explored and reviewed literature to answer the following questions:

1. *What is “home”? What is central to people’s concepts of home?*
2. *What is the relationship between sensory experiences and the concept of “home”?*
3. *What is known about the relationship between sensory experiences and personal identification and/or familiarity?*
4. *What is known about the relationship between personal identification/familiarity and basic psychological need satisfaction?*
5. *What is known about the relationship of basic psychological need satisfaction to inclusive learning settings?*
6. *How has “sense of inclusion” been addressed to date in botanical gardens and museums in general?*

The literature we found to answer each of the questions is summarized below. These ideas became the basis for this research project’s conceptual model and helped inform our data collection strategies.

What is “home”? What is central to people’s concepts of home?

Multiple disciplines have concerned themselves with the idea of “home,” with aims ranging from the physical engineering of housing to exploring class, gender, and race as they are experienced in domestic space. Accordingly, many authors have inventoried the ways people have attempted to define “home” within and across specific areas of scholarship. In general, the value of bringing these literatures together has been the acknowledgment across disciplines that ideas of home are constructed through the dynamic combination of personal psychological experience, social interactions between people, and the physical materiality of built environments (cf. Sixsmith, 1986; Després, 1991; Somerville, 1997). At the individual level, scholars have further framed the idea of home as inflected by someone’s personal history (both materially and their memory of it) and in terms of their concepts of self (e.g., Giuliani, 1991, Blunt et al., 2007). For example, Giuliani (1991) contends that someone’s concept of home relates to how much they identify with a place and how stable their relationship to that place is, particularly based on the degree to which they attempt to maintain or change that relationship. Significant attention has also been given to expanding and/or complicating the idea of home in the context of transition and/or displacement, such as experiences of migration (e.g. Ahmed, 1999), fleeing conflict or its consequences (e.g. Perez Murcia, 2019), being unhoused (e.g., Somerville, 1992), or moving to an assisted living facility (e.g., Gillsjö & Schwartz-Barcott, 2010). In light of these experiences, scholars argue convincingly that conventions related to property, comfort, privacy, and personal origin cannot be assumed to be universally applicable components of what constitutes home. Given

that “home” can encompass a complex range of symbolic meanings, Mallet (2004) concludes that the definition of “home” is largely contextual.

Meanwhile, Chang & Toh (2023) explore the ways that presenting certain foods as connected to one’s idea of home can serve as a way to communicate about place and identity. For the purposes of exploring responses to the prompt “What tastes like home?” we observed that our analysis should thus allow for as broad a range of meanings of home as possible. Building on the work of other scholars, Somerville (1992) offers a particularly comprehensive list of domains that we leveraged in interpreting meanings of home as articulated on sticky notes: shelter (i.e., material condition), hearth (i.e., emotional and physical wellbeing), heart (i.e., loving and caring social relations), privacy (i.e., control and privacy), roots (i.e., sense of individual identity), abode (i.e., living/sleeping place), and paradise (i.e., an ideal that is distinct from everyday life). Accordingly, our emerging coding scheme engages Somerville’s classifications of “home” as theoretical bases for content codes (i.e., those that describe the topical content of visitor sticky notes). To accommodate the potential range of context attached to these ideas, we also included a set of codes that pertain to communicative features of visitors’ sticky note responses.

What is the relationship between sensory experiences and the concept of “home”?

Scholarship from a variety of disciplines frequently refers to the importance of materiality and physical embodiment to an individual’s understandings of and attachments to a conceptual home (e.g., Bachelard, 1958; Giacomelli, 2020). Furthermore, the sensory associations one has with “home” are of consequence to how one experiences places in general (Ahmed, 1999; Lahiri, 2011). As Ahmed (1999) writes, “the locality intrudes into the senses: it defines what one smells, hears, touches, feels, remembers” (349). In addition, the importance of physical embodiment to describing and understanding “home” suggests that researchers should attempt to engage their senses alongside research participants wherever possible when describing shared sensory experiences that are identified as representative of home (Pink, 2003). For the purposes of this research, the shared sensory experience that was most accessible was the experience of the *Cultivate* exhibit itself; a note for data collection was that although the sensory experience in common might not necessarily evoke “home” on its own, it did provide the sensory context visitors had for responding about home. Accordingly, we observed that the research team should pay some attention to the sensory context surrounding the prompt (i.e., the sights, sounds, smells, and sensations near the sticky note wall).

Of particular interest to this project is that scholars frequently invoke food as a material connection to home, whether they focus on the sensory experiences associated with food (e.g., Maret & Gezyen, 2015) or not (e.g., Chang & Toh, 2023). The idea that food can symbolize home and help people feel at home is closely connected to questions of how sensory experiences relate to personal identification, which is discussed more specifically below. At the same time, scholarship that reflects these ideas also reinforces that “home” is constructed through norms and material practices (Pink, 2003; Sou & Webber, 2023) - and therefore a person can *create* a sense of home through preparing and/or purchasing food (cf. Brightwell, 2012; Sutton, 2013; Innocenti, 2018; Brown et al., 2019). To incorporate this idea,

our coding scheme engaged practices related to food as potential content codes for visitors' sticky note responses.

In addition, we observed that the act of defining home through food could also be reasonably connected in our analysis to expressions of relatedness (via feeling connected to the social aspects of home), competence (via sharing food-related knowledge and/or skill that accurately reflects a shared touchstone for a region and/or culture), and autonomy (via choosing to consume and/or share foods that feel like home, irrespective of one's immediate surroundings). Each of these qualities are defined below (Question #4) as indicating satisfaction of the three basic psychological needs as defined by self-determination theory (Deci & Ryan, 2000).

Meanwhile, as Sou & Webber (2023) convincingly argue in their discussion of the “sensory home,” it is equally possible to disrupt a sense of home by altering sensory experiences, and people experience this type of disruption in unequal measure due to dynamics of power at multiple scales (individual, neighborhood, state, etc.). Experiences of disruption and inequality, while less common in the sample of sticky note responses we reviewed, were nonetheless important to attend to in identifying the possible range of associations between taste and home; accordingly, our coding framework contains content codes intended to reflect these kinds of material circumstances.

What is known about the relationship between sensory experiences and personal identification and/or familiarity?

Sensory experiences

Importantly, different sensory experiences intersect physically even at the individual level. For example, while the term “taste” refers technically to the perception of sweet, salt, sour, bitter, and umami qualities via taste receptors, the combination of sensations through multiple systems (taste, smell, touch, and chemical-induced reactions and perceptions of things like temperature and pain) results in what we call flavor (Galaniha & Nolden, 2023). Beyond the mechanics of how sensory experiences intersect, multiple sensory experiences (sight, sound, smell, taste, and touch) also layer and compound in ways that we assign meaning (Pink, 2003).

Familiarity

From a psychological perspective, Mandel and colleagues (2008) define “familiarity” as a common language term to describe two distinct aspects of the psychological phenomenon of recognition. It references the predictions and expectations that generate recognition (e.g., “I know I’ve seen those pieces before, I wonder...”). It also references the behaviors and responses that accompany recognition (“I love when that happens.”) [Note: examples are provided for clarity and are not from Mandel et al.]. In either case, to qualify as familiarity, the response can not depend on future search, recall, or insights. Moreover, according to Mandel et al., Familiarity is always the result of varied psychological processes that come together to create a state and therefore, from a scientific perspective, is an outcome not an independent variable. In a model, the underlying processes vary enough to require being considered independently as the inputs.

Personal Identity

Personal identity has been defined as the set of characteristics, aspirations, values, and representations people use to define themselves (Marcia, 1980 as cited in Soenens & Vansteenkiste, 2011).

Relationship between Sensory Experiences and Familiarity and Personal Identity

Sensory input (including basic psychological need satisfaction) both forms identity and describes it. For example, growing up enjoying the smell of home-cooked cookies forms one's identity as, perhaps, "that's what made me become a pastry chef." On the other hand, loving the smell of cookies describes that identity, e.g., "I am someone who loves baking." This bidirectional phenomenon after it exists is described further in the literature reviewed to answer question #4.

Habituation and repeated exposure are important elements to shaping familiarity and personal identification in general, and some scholars have noted this in relation to sensory experience and/or taste specifically (e.g. Brown et al, 2019). Although humans typically express an evolutionary preference for sweet and fat foods in infancy, acquisition of new preferences and significant expressions of selectivity are common in an individual's first year or two of life. Throughout life, preferences continue to be cultivated through a person's connections to others, a broader sense of culture, and behavior within society - for example, as a consumer (Christensen, 2019). Moreover, the variation in taste preferences across cultural groups seems to be a product of specific shared practices, rather than any kind of physical difference in how people perceive taste (Laing et al., 1993). Because the sensory experiences associated with habitual practices are communicated from childhood and shape group norms and understandings, they can be important to self-expression. Furthermore, expressing taste preferences through preparing or procuring food can be an empowering way to stake a claim to an identity, whether that is an expression of closeness or distance (Christensen, 2019; Brown et al., 2019; Sou & Webber, 2023). The converse is also true, as the loss of sensory experiences of taste and/or smell can radically detract from a person's quality of life, bringing with it not only changes to the material reality of eating, but also profound changes to identity, social relationships, and sense-making about the world (Borges Watson et al, 2021; Galaniha & Nolden, 2023).

Sensory experiences and benefits associated with nature and botanic gardens more specifically.

Other sensory experiences germane to understanding visitors' responses to the "What tastes like home?" prompt are those that were associated with being at the *Cultivate* exhibition inside the botanical garden. Nature connection or *biophilia* has been defined multidimensionally as including such characteristics as attraction to and affiliation with nature; cognitive understanding and curiosity about natural phenomena, enjoyment, and comfort (Baxter & Pelletier, 2019; Chawla, 2022). This connection has been associated with developmental benefits (reviewed in Bowers et al., 2021) In a study of 138 eight- to ten-year-old economically disadvantaged elementary school students, Lanza and colleagues (2023) demonstrated that connection to nature was directly associated with higher overall socio-emotional learning skills, self-awareness, and relationship skills.

Some researchers have suggested that nature connection may be a basic psychological need, identifying how the connection meets each of nine criteria for qualifying as such (Baxter & Pelletier, 2019). More specifically, they explore nature connection as both a requirement (e.g., has positive consequences when satisfied and negative when frustrated; not culturally dependent) and a motive (e.g. elicits behavior designed to meet the need).

As a way of understanding satisfaction of the need, they introduce the term “nature contact,” which they define as “an immersive experience within a novel or somewhat novel natural environment” and note that some researchers (Mayer et al., 2009; Nisbet & Zelenski, 2011 as cited in Baxter & Pelletier, 2019) have shown even small amounts of contact generate a sense of nature-connectedness. With the metaphor of nature as a charger for a human battery that runs down (e.g., with fatigue in cognitive capacities as explained by Attention restoration theory, Kaplan & Kaplan, 1989 as cited in (Capaldi et al., 2015), the authors suggest that repeated familiar or novel nature exposures are necessary for well-being.

Extensive literature reviews and meta-analyses have determined that, across multiple studies, exposure to natural environments have been associated with mental health benefits such as emotional well-being (e.g., mood boost, happiness) and broader aspects of well-being such as vitality, meaningfulness, sense of autonomy (Capaldi et al., 2014, 2015; McMahan & Estes, 2015),

One particularly interesting and potentially relevant nature connection phenomenon is that of therapeutic benefit. For example, a study of an outdoor experience in homeless older youth showed that many experienced the natural setting as a relief or escape (Parry et al., 2021). Similarly, the garden and the Cultivate exhibit within it may function to activate ameliorate feelings visitors are having about “home.” Another example, to date only conceptualized theoretically, involves enhancing disaster resilience suggesting that individuals and communities not only benefit from, but also seek engagement with nature (Tidball, 2012).

Within this topic of mental health benefits of nature, to a far smaller degree, benefits of botanical gardens have been explored more specifically. Historically, botanic gardens have played a role in human wellbeing by contributing to research and public understanding of such topics as botanic contributions to nutrition, healthcare, financial poverty alleviation and community support (Waylen, 2006). A more recent review of 25 botanic garden studies from across the world revealed “psychological restoration” effects that promote restoration of attention capacities and individual wellbeing more generally (Mohamed et al., 2022).

Focusing on process toward these effects, a qualitative study of selected visitors, Shaw (Shaw, 2015) has theorized three dimensions potentially useful for understanding the effects of the “What tastes like home?” exhibit experience: sensibility, functionality, and rationality. Sensibility refers to visitors’ sense of welcoming, comfort and safety. Functionality describes garden features that lead to cognitive processes. Rationality describes visitor connection with six specific values: care, fairness, loyalty, authority, sanctity, and liberty. Not noted by the author, but of interest to our study is that these three dimensions map directly onto basic psychological need satisfaction (see section 4 below): sensibility to relatedness; functionality to competence; and rationality to autonomy.

Another process-oriented conceptualization categorizes health inducing processes as derived in three ways: (1) The Healing Garden School describes effects derived from the design and contents of the exhibit; (2) The Horticultural Therapy School where effects derive from the

activities in the exhibit; and (3) the Instorative or Cognitive School where the effects derive from a combination of the visitor characteristics and activities such that the visitor experiences a feeling of belonging and sense of identity (Dushkova & Ignatieva, 2020). Another more esoteric explanation has involved an understanding of how botanic gardens can elicit a poetic experience, connecting the visitor to a sense of peace or insight through “oneness with nature” (Aziz, 2015).

What is known about the relationship between personal identification/familiarity and basic psychological need satisfaction?

By what pathways might the “What tastes like home?” prompt lead to basic psychological need satisfaction (and in turn to sense of inclusion and motivation to engage)? To answer the question, we begin with a brief definition of basic psychological need satisfaction. Next, we address the bidirectional relationship between identity and need-satisfaction, i.e., how each can lead to the other. We then review literature on how need satisfaction can derive from identity experiences such as uniqueness, nostalgia, and auto-biographical memory, all of which can occur in response to the “What tastes like home?” prompt.

Basic Psychological Need Satisfaction

Basic psychological need satisfaction is a conceptual pillar of self-determination theory (SDT) which explains motivational quality as being internally regulated (intrinsic, identified, or integrated), externally regulated (introjected or extrinsic), or absent (amotivated). Associated with these qualities are three inter-related basic psychological needs for sense of relatedness, sense of competence, and sense of autonomy (R. M. Ryan & Deci, 2000) such that satisfaction of these needs is associated with internally regulated motivation; and frustration with externally regulated motivation or amotivation. Sense of relatedness, describes sense of two-way feelings of belonging, i.e., “they care about me; I care about them.” Sense of competence involves the feelings of the ability to set and achieve goals. Sense of autonomy is a bit trickier, referring to the alignment of “self” with choice making, i.e., the source of choice is the self, free from external pressures. Across cultures and developmental age groups, people exhibit these basic psychological needs and moreover, are attracted to situations where their satisfaction occurs (Deci & Ryan, 2012). Internally motivated regulated motivation is associated with long-term, durable positive outcomes—e.g., academic achievement, pro-social behaviors, wellbeing, etc. (Deci & Ryan, 2002). While the three needs are distinct, each need contributes to the other—as in the example of religious practice where competence (knowing about ritual and meaning) creates relatedness (e.g., leadership, acceptance) generating joy and choice, which in turn strengthens relatedness and continued learning/competence Jensen et al. (2014). In research studies both need satisfaction and need frustration are often highly correlated. (Deci & Vansteenkiste, 2004)

Self Determination and Identity

Whereas many identity theories consider “self” and “identity” to be one and the same (identity reflects self and self reflects identity), self-determination theory considers them to be distinctly different and thus contrastable. According to self-determination theory, alignment (i.e., minimal contrast) between “self” and “identity” is accompanied by need

satisfaction; misalignment (or high contrast, as might be the case with gender dysphoria when, for example, the “male” self is in a body identified as “female”) is accompanied by need frustration (Soenens & Vansteenkiste, 2011). One explanation for the success of the “What Tastes Like Home” prompt may be that it invites the respondent to align self with freely identifying the highly personal characteristics of “home” and “taste,” thus causing basic psychological need satisfaction. More specifically, an explanation for the prompt’s success may be that it assumes the participant’s agency for determining not only the association between sensory experience and home, but also for defining “home” itself. Moreover the prompt puts no conditions on the respondent’s feelings for either home or taste (as would a prompt such as “what favorite foods remind you of home?” or “what tastes like the comfort of home?”) Thus it might be surmised that the prompt invites the “self” to make free choice about definition of “home,” “taste,” and their association and thus engenders alignment between self and these two aspects of identity. Satisfaction of the need for autonomy would occur with the free choice; satisfaction of the need for competence would occur with the assumption that only the respondent has the expertise to respond; and satisfaction of the need for relatedness comes with sharing the self with the prompter who cared to ask.

Authenticity

In the literature, this self/identity alignment has been studied as “authenticity,” (Kristinsson, 2007; Vannini & Franzese, 2008) and has been used interchangeably with the psychological need for autonomy (R. M. Ryan & Deci, 2004). By definition, authenticity is accompanied by emotional experiences such that greater authenticity is accompanied by positive emotion and less authenticity by negative (Vannini & Franzese, 2008). Thus, within self-determination theory, authenticity has been measured with basic psychological need satisfaction (W. S. Ryan & Ryan, 2019; Soenens & Vansteenkiste, 2011). As concepts, authenticity have been criticized as being too individualistic and therefore not responsive to people from non-western “collectivist” cultures (e.g., Kristinsson, 2007). One of the advantages of defining authenticity from the perspective of SDT’s construct of basic psychological need satisfaction is that, in SDT, the concept of “alignment with self” includes adopting expectations of a group, i.e. it is equally as applicable to collectivist and individualist cultures (Chirkov et al., 2003, 2010).

Bidirectional Relationship between Identity/Authenticity and Basic Psychological Need Satisfaction

The relationship between identification and basic psychological need satisfaction is bi-directional (Soenens & Vansteenkiste, 2011). The experience of alignment with an authentic “self” leads to basic psychological need satisfaction (as was illustrated in our answer to question 3). Also, basic psychological need satisfaction reveals the “self” to which identity can align. This latter relationship is described here in the literature reviewed for answering question 4. This phenomenon of basic psychological need satisfaction revealing the authentic “self” occurs with the “longing” of nostalgia, the pride that can accompany uniqueness (Brewer, 1991), and the satisfying or frustrating effects of autobiographical memory. Each is described below. In their article about the ethics of authenticity in neuro-technologies, authors Mackenzie & Walker (2015) reference this seemingly contradictory bi-directionality as self-discovery and self-creation. The bi-directionality inherent in basic psychological need

satisfaction explains both: when my needs are satisfied, I discover who I am; I seek basic psychological need satisfaction to create who I am.

Identity-related experiences that can occur with the “What tastes like home?” prompt

Nostalgia, autobiographical memory and uniqueness are three identity related experiences that may contribute to coding the responses to the “What tastes like home?” prompt. Literature about each helps to define them and to explore their significance to the exhibit experience.

Autobiographical memories

Autobiographical memories are those that result from recall and mentally re-experiencing specific events and sensations from one's own life. They contain information about the self, contributing to one's identity. As reviewed by Philippe et al. (2011), research on these memories has followed three varied approaches, a categorization that may be useful for coding responses to the *What Tastes Like Home?* prompt. The narrative approach identifies how life stories, and the way people tell them reveal ways they make sense of their lives. A second approach focuses on motives for such goals as power, achievement, or intimacy. A third approach focuses on how the memory is experienced, e.g., how old it is, how vivid it is, if it is in the first or third person, how distanced or present it feels. And finally, these memories can be studied from a motivation or need satisfaction approach.

Among these memories are ones that play an important role in defining a person's identity and self-perception. These “self-defining memories” have been described as emotional, vivid, repeatedly retrieved, and linked to other similar memories,” (Singer & Solovey, 1993 as cited in Lekes et al., 2014). Basic psychological need satisfaction in relation to memory has been shown to play an important mediating role in the relationship between the memory and wellbeing (Philippe et al., 2011). Moreover, describing a need-satisfying memory was found to have immediate effect on situational wellbeing (Lekes et al., 2014).

Nostalgia

Nostalgia, a type of autobiographical memory, is a sentimental longing to experience again some real or imagined former pleasure (Kelley et al., 2022; Puente-Díaz & Cavazos-Arroyo, 2021). Nostalgia has been associated, sometimes causally, with psychological wellbeing in areas including social relationships; vitality, meaning of life, optimism, and subjective wellbeing (as reviewed in Kelley et al., 2022). An example of a causal relationship is, for instance, when nostalgia assuages loneliness by functioning as a motivation to approach others socially. (Wildschut et al, 2006 as cited in Kelly et al., 2022). With four studies, each with participants from both the USA and China, and three of which were experimental, Kelley and colleagues (2022) supported the hypothesis that nostalgia augments psychological wellbeing through authenticity. The experimental manipulations involved nostalgia in one study, with one group assigned to reporting on a “nostalgic” event and the other assigned to reporting on an “ordinary” event. In the second two experimental studies, researchers manipulated authenticity—with one group assigned to reporting on an event when they felt “authentic” and the second group reporting on an event when they felt “inauthentic.” With these findings, the authors surmise that, as a memory that has positive psychological effect, nostalgia involves more than simple autobiographical memory, it also involves an alignment

with sense of self. In this study, we may consider that, by the nature of the “tastes like home” metaphor, the prompt necessarily stimulates memory aligned with self, and as such, also stimulates feelings of wellbeing.

In another set of studies, researchers manipulated nostalgia—asking people to think of “a special moment” vs. “an ordinary moment.” Their first study established the gratitude aspect of relatedness as a mediator between nostalgia and optimism. The second study established relatedness more generally as a mediator between nostalgia and vitality. (Puente-Díaz & Cavazos-Arroyo, 2021). Based on these findings we might hypothesize that by evoking nostalgia, the “What tastes like home?” prompt leads not only to sense of relatedness but through relatedness to positive feelings such as optimism and vitality, both of which may contribute to sense of inclusion.

Uniqueness

Uniqueness can also lead to basic psychological need satisfaction. The term has been defined as “personal inclination to acknowledge oneself as having distinctive features with the feeling of worthiness; it refers to the feelings of being somehow different, and yet worthy simply because of being who one is, a kind of non-contingent self-worth” (Şimşek & Demir, 2013).

Engendering personal uniqueness, autobiographical memory, and nostalgia as vehicles toward sense of inclusion.

These literatures suggest that the “What tastes like home?” prompt may function to generate states that have been associated with basic psychological need satisfaction and therefore, sense of inclusion - which we address below with literature answering question #5, what is known about the relationship of basic psychological need satisfaction to inclusive learning settings.

What is known about the relationship of basic psychological need satisfaction to inclusive learning settings?

In the context of diversity and equity, inclusive environment has been defined as “the degree to which an employee perceives that he or she is an esteemed member of the work group through experiencing treatment that satisfies his or her needs for belongingness and uniqueness (Shore et al., 2011, p. 1265). Thus, by definition alone, inclusiveness can be associated with at least one aspect of basic psychological need satisfaction--relatedness.

The definition, which derives from research in industrial/organizational psychology, is situated in optimal distinctiveness theory (ODT; Brewer, 1991) which explains social identity or inclusion as deriving from the satisfaction of the contradictory and contemporaneous needs for belonging and uniqueness. While always in tension, optimum social identity functioning occurs when these needs are equally satisfied. The Work Group Inclusion Scale draws directly from this definition—using belonging and uniqueness subscales (Chung et al., 2020) to operationalize inclusion.

Another explanation (Jansen et al., 2014) augments ODT with Self-Determination Theory (SDT), a motivational theory that offers an alternative understanding of the coexisting,

How has “sense of inclusion” been addressed to date in botanical gardens and museums in general?

Engendering sense of inclusion has become an important field of study across informal learning institutions. Among the first to identify inclusion as central to informal learning environments, Sandell (Sandell, 1998) suggested that these institutions, and more specifically, museums could be “agents” of social inclusion. In 2010, in research seeking to understand the social role of botanic gardens in the United Kingdom, and to lay groundwork for expanding the social role of museums, researchers revealed that efforts to broaden audiences and undermine perceptions that botanic gardens are “just for a particular elite of white, middle class older people,” were at the time “disparate and varied” among few organizations (Dodd & Jones, 2010, p.2). They found that existing community outreach efforts were based largely on the commonality premise that all lives are connected to the plant world and thus, the plant world is of interest to all. This type of review helped establish the need for botanic garden commitment to creating inclusive learning environments. The American Public Gardens Association created their 2020-2025 strategic plan “with an IDEA [Inclusion, Diversity, Equity, and Access] lens” (American Public Gardens Association, 2024).

Today, after a quarter of a century, authors continue to call for building inclusivity into these venues and their activities. Over this period of time, “inclusivity” has come to be addressed in multiple ways including creating community partnerships and outreach (Rakow et al., 2021); addressing historical narratives and recognizing indigenous land (e.g., (Boehi, 2021; Hassouna, 2024) internal diversity, equity, access, and inclusion practices and staff training (Catlin-Legutko & Taylor, 2021; Nalls, 2021); physical design for accessibility and inclusion (e.g., Devi & Kalotra, 2024); and seeking community feedback for continuous improvement (e.g., Lynch, 2017). Many scholars have defined inclusion in relation to the absence of feelings of exclusion, associated with social stereotypes, feelings of alienation, disempowerment, and inequality (exclusion from STEM (Godec et al., 2022; Taylor, 2017) and compromised identity (Avraamidou, 2020).

In 2022, as part of this movement toward inclusion, in conjunction with the Denver Botanic Gardens and with support from the Institute of Museum and Library Services, the Association launched The IDEA Center for Public Gardens™ where annual cohorts of participating institutions develop practices, fund scholarships, and build alliances for furthering inclusion, diversity, equity and access both within and among their institutions (Plummer, 2022).

Efforts toward inclusiveness can involve community engagement that takes place both within and outside of the garden grounds. Strategies for creating inclusion also have been identified as “co-creation”, e.g., working with ownership groups to create exhibits involving indigenous objects and/or knowledge (Moore et al., 2022), diversifying staff and offering access at low to no cost (Dawson, 2018), and identifying exclusionary practices so as to alter them to create a more inclusive environment (Coleman, 2018; Wysocki, 2019).

Garden inclusivity efforts include creating similar spaces and opportunities in community settings e.g., Melhem et al., 2023). They also include engaging communities with the exhibits. For example, the Big Picnic project generated hundreds of exhibitions across multiple cultural institutions each engaging with community organizations as design, implementation, and research partners (Alexopoulos & Moussouri, 2021). Another strategy has

been to utilize the garden to help communities confront complex environmental issues, e.g., The Communities in Nature initiative in the UK (Vergou & Willison, 2016).

In addition to these structural and community outreach efforts, researchers have addressed strategies for creating sense of inclusion when visiting museum (including garden) exhibits and programming—the focus of this What Tastes Like Home study. Some researchers have sought to expose how historically excluded groups find meaning from botanic garden visits. For example, Rahm (2018) called for moving from “teaching *about* plants” to “engaging deeply with place, land and the world.” This study of how urban youth of color find meaning in botanical garden visits documented ways of “desettling” the “colonial discourse and world view” of botanical gardens.”

Beyond these varied programs and their strategies, although focused on formal education, research on school gardens provides a resource for information about creating inclusive garden environments. The school garden support organization network has created resources specifically for “strengthening equity and inclusion in garden education”. (School Garden Support Organization Network, 2024). A section for creating “liberating learning spaces” can be found amid sections that include self-reflection on organizational exclusionary practices, leadership responsivity, assessing and strengthening team culture and structure, and uplifting and collaborating with community. These topics suggest that exclusivity has deep roots in organizational culture and developing inclusive practices in the visitor space alone is necessary, but not sufficient for creating deeply inclusive environments.

Methodology

Study design

To best benefit from the collaborative nature of the joint USBG-CRE research agreement, we adopted an emergent study design process. Based on the literature review, the process involved six steps allowing for collaborative design and participation in each: (1) conceptual model development to guide how constructs from the literature might inform data collection and analysis, (2) initial coding framework development to guide sticky note and interview data analysis, (3) questionnaire and structured interview development to reflect the conceptual model (4) questionnaire and interview data collection, (5) questionnaire and interview data analysis (5) analysis and meaning making with USBG learning and engagement team members and professionals from external organizations.

To answer the research questions, our research plan included questionnaire and interviews with visitors, thematic analysis of interviews, descriptive and causal pathway analysis of questionnaire data, and feedback and review from the USBG team and from external informal education professionals. Table 1 lists how each of these sources and analyses addressed each research question.

Table 1. Data sources and analysis approaches for answering the research questions.

	Data Source and Analyses					
	Questionnaire descriptives	Interviews with thematic analysis	Sticky Note thematic analysis	fsQCA*	USBG Team review & feedback	External review & feedback
Q1 Within the context of the USBG’s exhibit, <i>Cultivate: Growing Food in a Changing World</i> , how do people respond to the question, “What tastes like home?” and why do they respond that way						
a. How do people interpret the prompt, “What tastes like home?”	✓	✓	✓			
b. What aspects of their identities/ experiences do people deem relevant to the question?		✓	✓			
c. What kinds of experiences and responses emerge from this question?	✓	✓		✓		
d. What processes led to the responses	✓	✓		✓		
e. What contexts inform the responses (social, environmental, etc.)?		✓				
Q2. What might these insights mean for public gardens?					✓	
Q3. What might these insights mean for creating inclusive learning environments in general?						✓

* fuzzy set Qualitative Comparative Analysis

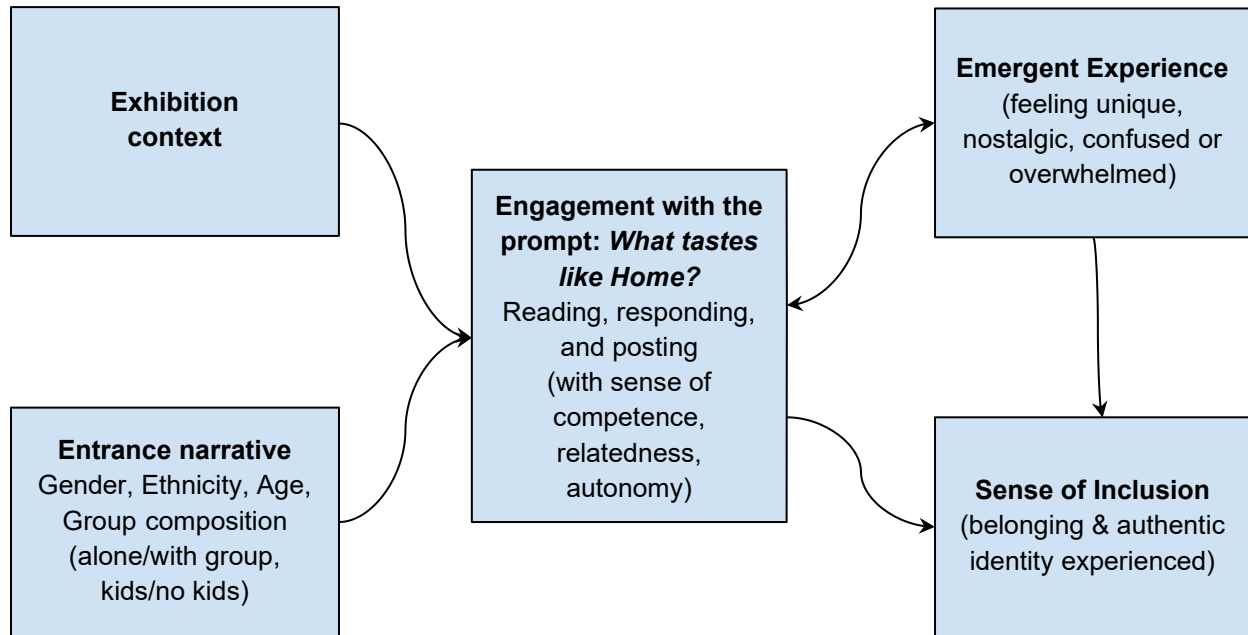
Collecting data using both questionnaires and interviews served multiple purposes. In order to keep the questionnaire short so as not to burden visitors and increase the number of willing volunteers, we relied on interviews to supply detail we could use to flesh out the questionnaire data. Moreover, as can be seen in Table 1, the interview addressed issues beyond the Questionnaire's reach, e.g., information about the identities and experiences people deemed relevant to answering the question and the contexts that informed their responses.

Conceptual Model

In planning this study, we aimed to use joint USBG-CRE experience and what we learned from our literature scan to create a conceptual model that could lead us to answering our research questions. Thus, based primarily on our literature review and augmented with staff and researcher experience, our conceptual model, illustrated in Figure 1 derived from the following assumptions:

1. Visitors entered the exhibition experience (**exhibition context**) with personal experiences and identities (**entrance narrative**).
2. They **engaged** with the exhibit in two stages: Interpreting/responding and posting.
3. Both stages could contribute to or detract from their basic psychological need satisfaction (**sense of competence, relatedness, and autonomy**).
4. During their exhibit engagement they may **experience** sense of uniqueness, nostalgia or confusion which in turn would affect their basic psychological need satisfaction.
5. Contribution to **sense of inclusion** emerges from any combination of experiencing basic psychological need satisfaction (or frustration) during the exhibit and/or feeling unique, nostalgic, or confused.

Figure 1: Conceptual model for how the “What tastes like home?” response wall led to sense of inclusion.



Initial Coding Framework

Since the purpose of this research study was to understand the processes the “What tastes like home?” response wall generated toward sense of inclusion, we sought to find examples of these processes, what constituted them, and how and under what conditions they occurred. Therefore, our initial coding framework was devised not only as a way to code the content of sticky notes, but also as a tool to guide instrument development, interview data analysis, and conceptual model refinement.

The first iteration of the coding framework derived from our literature scan and our inductive analysis of a sample of sticky note responses left by visitors to USBG before our data collection. We organized the framework into three types of codes we found in the sticky notes. **Content codes** described the topical meaning of what a person wrote in answer to the “What tastes like home?” question. **Communication codes** described the kind of communication that appeared to be happening in a person’s response, even if it did not directly address the prompt. **Motivation codes** described evidence of basic psychological need satisfaction as defined by Self Determination Theory.

One reason for organizing the codes into these content, communication, and motivation categories was to ensure that meaning-making from visitor data could align with our conceptual model (described below). Many of the content codes (e.g., name of food, people) describe a visitor’s “response to the prompt” and “entrance narrative” (e.g., geographic location, cultural tradition) as articulated in the model. Exhibition context codes (a subset of content codes) were written to provide ways of grouping and understanding effects of

exhibition experiences. The inclusion of communication and motivation codes was to ensure that the coding framework could extend beyond the content reflected on sticky notes to reflect vehicles for visitors’ response to the prompt and “emergent experience” (e.g., uniqueness, nostalgia, need satisfaction/frustration).

We expected that this initial framework would be enhanced based on themes discovered in the interview analysis process. The final coding framework can be found in Appendix A.

Questionnaire development

To test our conceptual model, we created a questionnaire that would generate data to reflect each assumption and domain that comprised the model. We provide a summary of how we operationalized each here. The full visitor questionnaire is included in Appendix B. It is important to note that in

Entrance narrative

The questionnaire addressed demographic aspects of respondents’ entrance narrative: the size and age composition of the group with whom they were attending the exhibit; age, U.S. residence, race/ethnicity and gender. Table 2 lists the questions and response options, and source if adopted from another questionnaire.

Table 2. Entrance narrative questionnaire items, response options, and sources

Questionnaire items	Response options	Source
Are you visiting alone or in a group today?	Alone In a group	USBG’s Four Season study conducted by the Kera Collective
Does your group include any children?	Yes No	
If yes, what are their ages?	Under 12 12-17	
In what year were you born?	Four-digit response	
Do you live in the United States?	Yes No	
With which US Census racial or ethnic group(s) do you identify? Select all that apply.	American Indian or Alaskan Native Asian or Asian American Black or African American Hispanic, Latino, Latina, or LatinX/Latine Middle Eastern or North African Native Hawaiian or Pacific Islander White Multiracial Additional affiliation: _____ Prefer not to answer	Kera Collective Four Season study with response options from Audience Focus evaluation of <i>Cultivate</i> with further additions for self-description and preference not to answer.
What is your gender identity?	Female Male Non-Binary Prefer to self-describe: _____ Prefer not to answer.	Audience Focus evaluation of <i>Cultivate</i> , with addition of the self-description option.

Engagement with the prompt

Based on our literature review, consequent conceptual model (Figure 1), we understood “engagement with the prompt” to encompass multiple aspects of how visitors may have interacted with the response-wall activity. We wanted to know just what they did in the activity, from what kinds of experiences they were drawing, and the socio-personal context that was motivating them. Germane to our literature review was the role of basic psychological need satisfaction. We therefore included items that would measure sense of competence, relatedness, and autonomy at important phases of the activity (reading the prompt for those who did not post a response, writing a response and viewing it on the wall for those who did). Table 3 lists the questions, response options, and source of the related items.

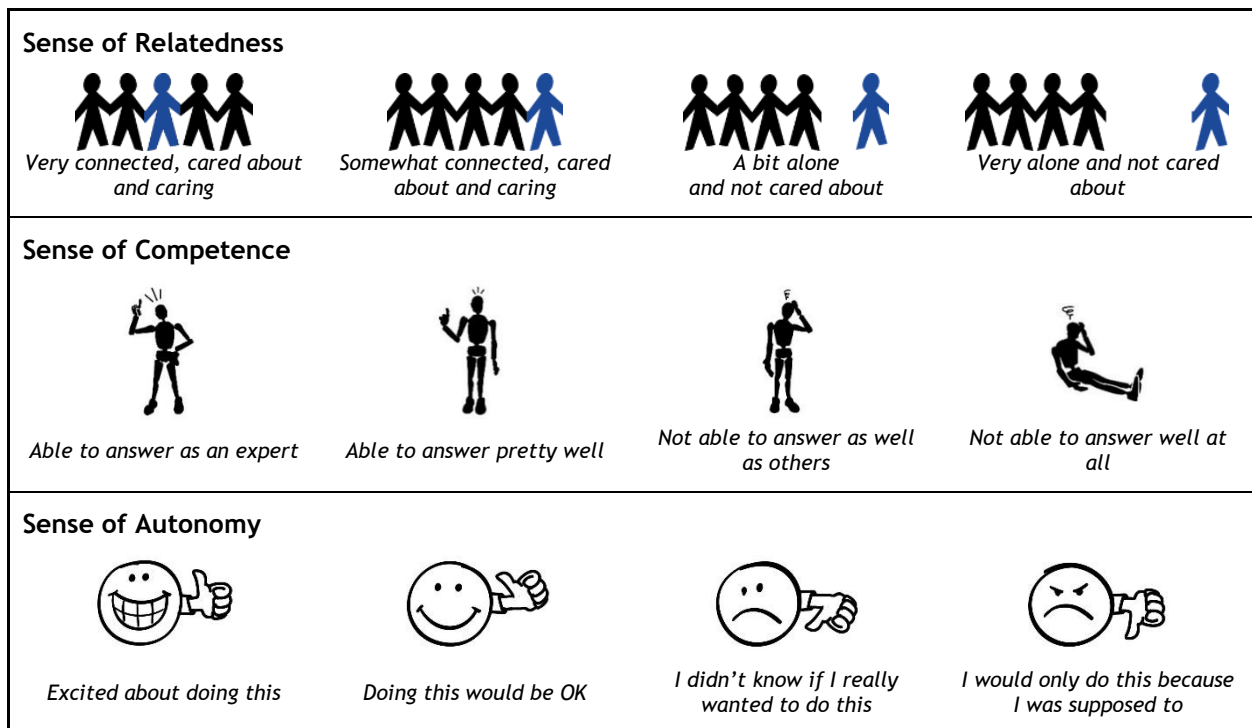
Table 3. Engagement with the prompt: questionnaire items, response options, and sources

Questionnaire items	Response options	Source
In the area with the question “What tastes like home?” what did you do? (check as many as apply)	Considered the prompt, Read sticky notes, Wrote a sticky note, Talked about what others wrote on a sticky note, Talked about what you wrote on a sticky note, Talked about the prompt itself.	Ad hoc for this study
When you read the question, “What tastes like home?” which of the following things did you think about? (Check as many as apply).	A type of food I like, A place I consider my home, My cultural heritage, A person or group I feel connected to, A specific time in my life, A restaurant or brand of food I like, Cooking or preparing food Agriculture, My experience at the US Botanic Garden today. Something else (please share)_____	This list, designed to address research question 1c (What kinds of experiences do people deem relevant to this question) derived from the initial review of sticky notes.
Think about what you wrote on your sticky note. Which of the following statements describe how you answered the question, “What tastes like home?” (Check as many as apply)	I wanted to tell the US Botanic Garden something about myself. I wanted to tell other visitors something about myself. I wanted to contribute to something larger than myself. I wanted to show how I am similar to or connected to other people. I wanted to show how I’m different from other people. I wanted to explain something else I wrote. I wanted to say something funny. I wanted to say something beautiful. Something else (please share)_____	This list, designed to address the research question 1e (What contexts inform the responses?) derived from the initial review of sticky notes and collaboration team input for socio-personal context.
<p>Instruction: The questions below are about the experience you had with the question, “What tastes like home?” We will ask you about two separate moments:</p> <ol style="list-style-type: none"> 1. When you thought about and wrote your response to the question 2. When you posted your sticky note <p>Please choose the answers that are most like the way you felt in these specific moments.</p>		
<p>The questions below are about the experience you had when you read the question, “What tastes like home?” Please choose the answers that are most like the way you felt.</p>		

Questionnaire items	Response options	Source
Reading the question (“What tastes like home?”) made me feel...	See Sense of Relatedness in Figure 2.	Adapted from the Basic Psychological Need Satisfaction Scale (Deci & Ryan, 2000; Gagne, 2003)*
	See Sense of Competence in Figure 2	
	See Sense of Autonomy in Figure 2	
Answering the question (“What tastes like home?”) made me feel...	See Sense of Relatedness in Figure 2.	
	See Sense of Competence in Figure 2	
	See Sense of Autonomy in Figure 2	
Seeing my sticky note on the wall made me feel...	See Sense of Relatedness in Figure 2.	
	See Sense of Competence in Figure 2	
	See Sense of Autonomy in Figure 2	

*For purposes of determining the validity of using these single graphical response items, we tested them among 113 respondents from a Qualtrics panel responding to the “What tastes like home?” question. After reading about the response wall setting and answering the “What tastes like home?” question, they responded to the questions above along with the original 9-item basic psychological need satisfaction short form (Chen et al., 2014). Pearson correlations (n=100) between the single-item graphical responses and the responses on the short form subscales demonstrated moderate to low associations (Wanous et al., 1997; relatedness $r^2 = .428$, competence $r^2 = .399$, autonomy $r^2 = .492$). However, despite acceptable reliability of the whole basic psychological needs satisfaction scale ($\alpha = .77$), internal consistency of the subscales was low (relatedness $\alpha = .44$, competence $\alpha = .38$, autonomy $\alpha = .56$). Using reasoning suggested by Bergkvist and colleagues (2007), we could not have expected correlations higher than the subscale reliabilities. Given that limitation, we determined that the associations between the single and multi-item responses were at least comparable and perhaps more reliable than the perhaps noisier three-item subscales. For that reason, we proceeded to use the graphic single item responses in the questionnaire.

Figure 2: Images used in visitor questionnaire



Emergent experience

Following the single-item format of measuring engagement, and to maintain a short, visit-friendly questionnaire, we likewise created single item responses to (grossly) approximate uniqueness, nostalgia, and confusion, and overwhelm. To this purpose, as described in Table 4, we created four ad-hoc response items to be answered in relation to the parts of the response-wall activity they experienced. Visitors who posted a sticky note answered different questions than those who did not.

Table 4. Emergent experience questionnaire items, response options, and sources

Questionnaire items	Response options	Source
Visitors who posted a sticky note responded to the following two questions: When you were thinking about how to respond to the question, “What tastes like home?” how much did you experience each of the ways of feeling below? After you posted your answer to the question, “What tastes like home?” on the wall, how much did you experience each of the ways of feeling below?		
Feeling unique - like I had something special to say	1 = not at all 2 = a little, 3 = some, 4 = a lot	Ad hoc for this study
Feeling nostalgic - warmly in touch with something from my past		
Feeling confused		
Feeling overwhelmed		
Visitors who posted a sticky note responded to the following two questions: When you read the question, “What tastes like home?” how much did you experience each of the ways of feeling below?		
Feeling unique - like I had something special to say	1 = not at all 2 = a little, 3 = some, 4 = a lot	Ad hoc for this study
Feeling nostalgic - warmly in touch with something from my past		
Feeling confused		
Feeling overwhelmed		
Which of the following statements best describes why you did NOT leave a sticky note at the wall?	I could not think of anything to write I had too many ideas to decide between I wasn't interested in responding Another reason: _____	

Sense of inclusion

To measure sense of inclusion we adapted items from the Perceived Group Inclusion scale (Jansen et al., 2014). Items 1-8 cover sense of belonging. Items 2,5, and 7 have been adapted to fit the question stem and context, with inspiration from (Price & Applebaum, 2022, sense of belonging at museums and cultural centers). In this study's data, subscale reliability on these eight items was $\alpha=0.93$. Items 9-16 cover sense of self-authenticity ($\alpha=0.97$) and appear as presented by Jansen et al. (2014).

Table 5. Sense of inclusion questionnaire items, response options, and sources

Questionnaire items	Response options	Source
By posing the question, “What tastes like home?” the United States Botanic Garden...		
Sense of Belonging		
gives me the feeling that I belong here		
gives me the feeling that I am connected to other guests		adapted
gives me the feeling that I fit in		
treats me as an insider		
seems to have designed this for me		adapted
appreciates me		
seems to have designed this for me		
cares about me		
Self-Authenticity		
allows me to be authentic	1=strongly disagree	
allows me to be who I am	2	
allows me to express my authentic self	3	
allows me to present myself the way I am	4	
encourages me to be authentic	5=strongly agree	
encourages me to be who I am		
encourages me to express my authentic self		
encourages me to present myself the way I am		

Interview development

In this study, the purpose of the interviews was primarily to gain more context for visitors’ thought processes than was possible to get from closed-ended questionnaire responses. Accordingly, we created the interview instrument (Appendix C) so that visitors’ interview responses could be matched with their responses to our questionnaire. We did this by assigning each visitor a unique ID that was entered at the end of their electronic questionnaire form and included in data collectors’ paper notes during the interview.

The structured interview began by asking about the location and actual content of each visitors’ sticky note, along with their conscious reasoning for including that content. Next, we invited visitors to slowly focus on specific elements of their experience that would allow us to align specific emotional associations and thought processes to discrete components of our conceptual model. Interviewees were asked to describe their immediate reactions to encountering the prompt “What tastes like home?”, then what they experienced while actually responding to the prompt and placing their sticky notes on the wall. Because of the role basic psychological need satisfaction and frustration play in our conceptual model, we asked interviewees to comment on what about their experiences seemed to support or detract from their sense of these needs. These questions were intended to help our team identify specific features of the experiences’ design or context that could be further analyzed to provide concrete recommendations for people designing similar experiences in settings like the Garden. Lastly, interviewees were invited to share why they thought USBG included the response wall as part of the exhibit experience; this question was intended to help our team better understand what assumptions visitors made about the opportunity to anonymously

answer a question in public and what organizational goals visitors might associate with the specific question, “What tastes like home?”

Instrument testing

Our team finalized the instruments to be used at USBG based on a combination of 1) evidence for what would provide the best data quality, 2) evidence of average speed of completion and any questions that appear to be challenging for visitors to COSI, and 3) input from our colleagues at USBG about what is feasible and appropriate for the Garden context. For example, on the interview protocol, we chose to adjust the sequence and format of specific interview questions in response to testing, and we streamlined questions where possible to keep the length of the instruments manageable for respondents and reasonably aligned with the questionnaire.

Questionnaire and interview data collection protocol

The study invited adult visitors to USBG’s *Cultivate* exhibit to share their experiences with and feelings about the prompt, “What tastes like home?” While we did speak to a few visitors who did not leave a sticky note on the response wall, our data primarily reflects visitors who posted to the response wall. Participants who agreed to take part in our research study first completed a brief questionnaire, administered on electronic tablets. The questionnaire (described in more detail below) focused on specific constructs within our conceptual model, with the goal of allowing us to make systematic meaning of visitor responses to the overall experience they had with the question, “What tastes like home?” We also invited questionnaire respondents to complete a facilitated interview intended to help us better understand their thinking about the prompt and their written responses to it. Data collection at USBG took place on March 13-14 and May 9-11, 2024, and included data collectors from both COSI and USBG. Respondents who completed a questionnaire were thanked with a seed packet, and those who also completed an interview additionally received a personal cutlery set as a token of appreciation. During data collection at USBG, data collectors also observed the immediate area surrounding the response wall to provide additional context for what we learn from questionnaires and interviews (e.g., where a particular respondent’s sticky note was located, or that it had been removed).

Prior to data collection at USBG, we received approval of an external Institutional Research Board (VIRB by Viable Insights) and tested our study instruments in two ways. First, to explore the utility and validity of our questionnaire questions before data collection, we invited a panel of survey respondents (secured through our survey platform, Qualtrics) to respond to the prompt (“What tastes like home?”), complete our questionnaire, and complete a short list of already-validated items. The inclusion of the already-validated items helped us estimate how well our purpose-built questions related to the same constructs (basic psychological need satisfaction) reflect the areas of interest. The inclusion of the prompt response provided grounding for the other questionnaire responses, but it also allowed us to explore any features of the responses from USBG visitors that appeared to be a condition of the Garden context. Second, the COSI research team tested the usability and length of both the questionnaire and interview instruments by inviting visitors to our own institution (COSI, a science center) to take them before data collection proceeds at USBG.

Analysis & Meaning Making

Interview analysis

In keeping with the strategy of engaging both USBG and COSI team members in all aspects of the study, analysis of interview data was a collaborative effort. First, we identified two members of the COSI team and three members of the USBG team who would participate in applying the coding framework to the interview data. All coders met to review and ensure alignment on the initial version of the coding framework, then began coding with each question (excepting the final one on the interview) assigned to an individual coder. During this process, each coder applied all available codes, flagging those about which they were uncertain and identifying possible new codes to add to suit the specific content of the data associated with their question(s). The coders then met again to discuss areas of uncertainty and come to consensus about how best to apply specific codes to those cases. The team also compared notes on potential codes to add and synthesized these ideas into a new set of **mechanics codes**, which focused on visitors' interactions with the wall itself, other visitors' responses, and the activity materials. All coders then took a final pass at their initial coding efforts to apply new codes where applicable, revise codes as appropriate on uncertain cases, and spot check initial coding for fidelity with the framework and other coders. The lead coder (Hayde) also reviewed all coders' final analyses to provide another check for fidelity. The finalized coding framework can be found in Appendix A.

To code the final question (focused on visitors' ideas about why USBG might include the response wall in the exhibit), a larger group of USBG and COSI team members met in a structured workshop to identify themes among visitors' responses and provide more context for USBG's actual goals for visitors. The COSI team used notes from this discussion to create a question-specific list of inductive codes, which USBG leads reviewed for accuracy. The COSI team then used those codes to analyze data from that question.

FsQCA

Following fsQCA protocol (see Appendix D), our fsQCA involved three steps: creating a measurement model for each outcome, calibrating conditions and outcomes, analyzing each model for emergent pathways to the outcome. Each step is described below:

Models Tested

We used a two-step modeling approach. First, we sought to identify pathways to both the presence and absence of sense of inclusion, the outcome we were seeking to explain. Next, in order to focus more directly on the exhibit-wall experience, we ran the same analysis on the participants who had posted a sticky note - experiencing reading the prompt, responding, and then seeing their response on the wall. By focusing on this group specifically, we could learn more about how writing and posting the prompt may have led to sense of inclusion.

Thus, we tested the four models described in table XXX.

Table 6: Outcomes and conditions for four models tested with fsQCA.

Outcome	High Sense of Inclusion present			
	Present	Absent	Present	Absent
Dataset	Full	Full	Posters only	Posters only
Conditions				
Historically marginalized population	✓	✓	✓	✓
High sense of uniqueness	✓	✓	✓	✓
Felt Highly Nostalgic	✓	✓	✓	✓
Highly confused or overwhelmed	✓	✓	✓	✓
Basic psychological need satisfaction*	✓	✓	✓	✓
Did not post a sticky note	✓	✓		

* Sense of competence, relatedness, & autonomy

Calibration

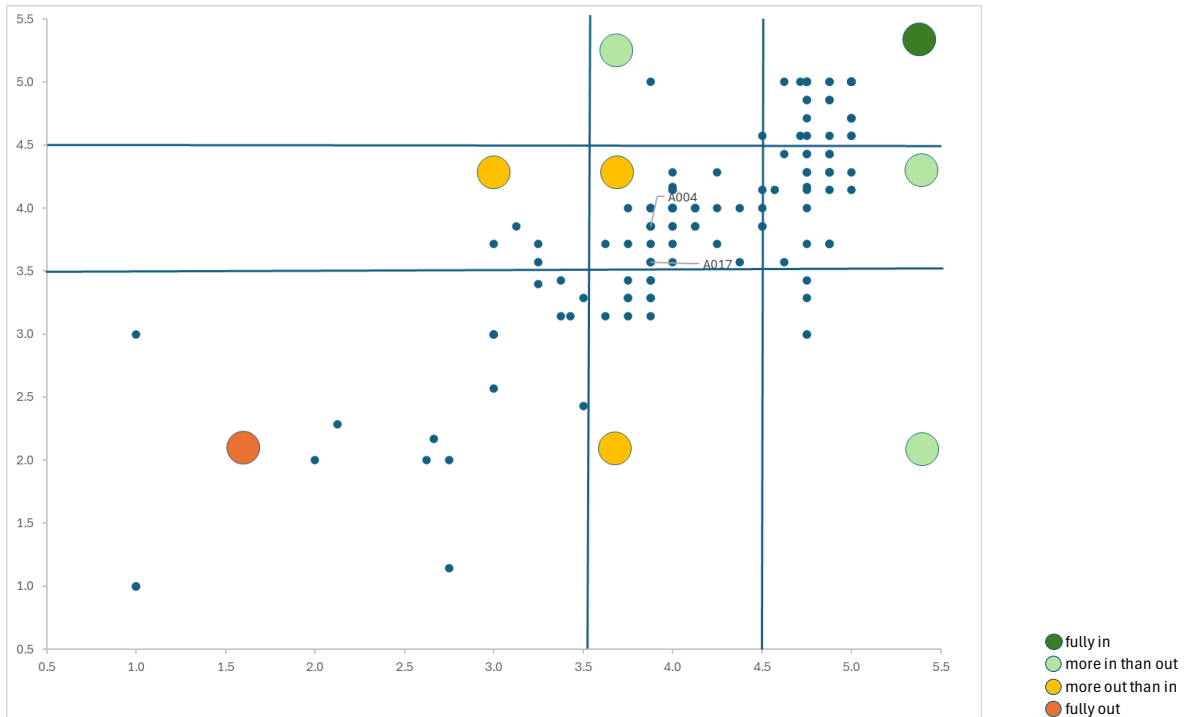
Outcome - High Sense of Inclusion

The high sense of inclusion outcome was calibrated using average responses to the authenticity and belonging subscale domains of the sense of inclusion scale (derived from Jansen et al., 2014). Respondents were considered fully in the set if items in each domain averaged 4.5 or above (on a scale ranging from 1 to 5). They were considered fully out of the set if both domain averages were less than or equal to 3.5. Among the remainder (with any subscale domain average between 3.5 and 4.5), respondents averaging high in one domain were considered more in than out. Those considered more out than in averaged either moderately (between 3.5 and 4.5) in both domains or moderately in one domain and low (less than or equal to 3.5) in the other.

Table 7: Distribution of respondents in relation to the set of respondents who felt high sense of uniqueness

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
57	33	29	25

Figure 3: Distribution of full set across sets related to high sense of inclusion



Conditions

From a historically marginalized population

Being from a highly **historically marginalized population** was calibrated based on gender (male/not male) and race/ethnicity (not Caucasian). Respondents both not male and not Caucasian were calibrated to be fully in the set. Caucasian males were fully out. Among the remainder the cut-point was at race and ethnicity such that non-Caucasian male respondents were more in than out of the set; Caucasian non-males were more out than in.

Table 8: Distribution of respondents in relation to set that felt high sense of uniqueness

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
46	12	20	76

Uniqueness

High Sense of Uniqueness was calibrated based on the average of visitor responses to the questions about their sense of uniqueness when reading the question, thinking about how to respond, and posting their response. On the four-point scale (1 to 4), those who averaged greater than 3.5 were coded as fully in the set, those who averaged less than 2.0 were coded fully out. We used 3.0 as the cut such that respondents who averaged 2 or more and less than 3 were considered more out than in and those who averaged 3 or more and less than or equal to 3.5 were more in than out.

Table 9: Distribution of respondents in relation to set that felt high sense of uniqueness

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
57	33	29	25

Nostalgia

The **felt highly nostalgic** condition was calibrated based on the average of responses to the questions about their sense of nostalgia when thinking about how to respond (reading the prompt), writing their sticky note, and seeing their response on the wall. Respondents who did not post a sticky note on the wall provided one measure of nostalgia - when they read the prompt. On the four-point scale (1 to 4), those who averaged greater than 3.5 were coded as fully in the set, those who averaged less than 2.0 were coded fully out. We used 3.0 as the cut such that respondents who averaged 2 or more and less than 3 were considered more out than in and those who averaged 3 or more and less than or equal to 3.5 were more in than out.

Table 10: Distribution of respondents in relation to THE set that felt highly nostalgic

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
74	22	34	16

Confusion & Overwhelm

The **highly confused or overwhelmed** condition was calibrated based on the average of responses to two questions, one about feeling confused and the other about feeling overwhelmed, when reading the question, thinking about how to respond, and posting their response—six items total. For respondents who did not post a sticky note the calibrated value was based only on the responses to overwhelm and confusion when they read the prompt. Respondents who averaged greater than 2.0 on the three-point scale (1 to 3) were coded as fully in the set, those who averaged a 1.0 were coded as fully out. We used 1.5 as the cut point such that respondents who averaged 1.5 or more and less than 2 were considered more in than out and those who averaged less than 1.5 and more than 1 were more out than in.

Table 11: Distribution of respondents in relation to the set or respondents that confused and overwhelmed.

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
2	11	18	112

Basic Psychological Need Satisfaction

High basic psychological need satisfaction. For this condition we averaged responses across the basic psychological need satisfaction items. For respondents who did not post a sticky note, the average included three “read the prompt” items, one each for competence, relatedness, and autonomy. For respondents who posted a sticky note, the average included

three “answered the question” items and three “seeing my sticky note on the wall” items six items (two each for competence, relatedness, and autonomy.) Our calibration considered that average response of 4 across all the items was fully in the set. Those less than 3 were fully out of the set. We used 3.7 as the cut point such that averages greater than 3.7 and less than 4.0 were more in than out and averages 3.7 or less and greater than or equal to 3.0 were more out than in.

Table 12: Distribution of respondents who reported high basic psychological need satisfaction

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
21	23	81	21

In order to better understand the how the experience led to inclusion, for those who completed the experience, i.e., posted their response on the wall, we divided basic psychological need satisfaction into the responding and posting aspects of the experience. Thus, we created two additional conditions: **Highly need satisfied when responding** and **highly need satisfied when posting**. Both were calculated based on the same cutoffs as the more general condition. The difference was that each was based on the average of only the three variables that described sense of competence, relatedness, and autonomy during the respective part of the activity.

Table 13: Distribution of high basic psychological need satisfaction when responding

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
22	53	49	6

Table 14: Distribution of High basic psychological need satisfaction when posting

Fully in (1.0)	More in than out (.7)	More out than in (.3)	Fully out (0)
42	38	49	1

Table 15. Crisp set (dichotomous) distribution of respondents who posted a sticky note

Fully in (1.0)	Fully out (0.0)
132	15

Meaning making with collaborators and colleagues

Essential to the collaborative nature of this research project was interpretation of the results by USBG collaborators as well as colleagues who might more generally use the findings. For that reason, we scheduled an in-person presentation of findings to [description of who met], most of whom were involved with study design, data collection, and/or qualitative coding.

After the presentation, group discussion contributed interpretation and application of the results.

Also important to the research was feedback from colleagues about the utility of our findings. For this reason, we presented the findings at a session of the Association of Science and Technology Centers annual meeting in Portland, Oregon, September 2025.

Data Description and Results

As described above, we addressed our first research question through a combination of direct responses to our questionnaire and direct responses to our interview, conducted with a subset of questionnaire respondents. This section of the report summarizes quantitative findings from the questionnaire and themes reflected in interviews. In all, these data represent questionnaire responses from 156 adult visitors to USBG, 63 of whom also completed a brief interview.

Questionnaire Responses

Entrance Narrative

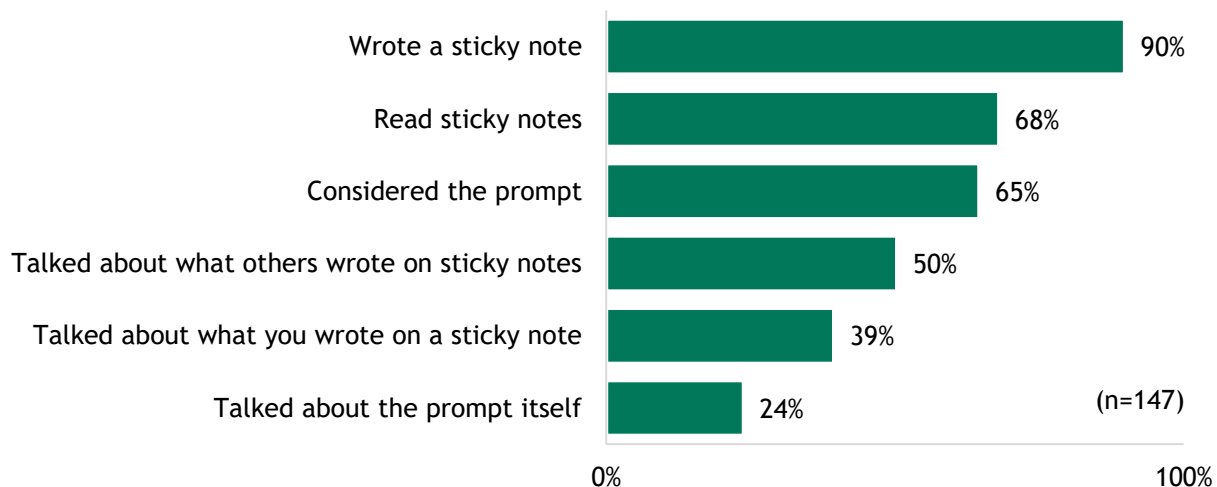
Participants demographics. Participants responded to questions about their age, residence, race/ethnicity, and gender identity. They also responded to a question about their group composition for that day’s visit. Selected highlights include:

- The **average age** of participants was **33 years old**
- **90%** of participants **resided in the US**
- **42%** of participants identified as **multi-racial or a race other than white**
- **71%** of participants identified as **female**
- **12%** of participants were visiting USBG **with kids** under age 18

Engagement with the Response Wall Exhibit

Most questionnaire participants (90%) wrote a sticky note. Overall, respondents were more likely to read the response wall (i.e., the prompt and sticky notes) than talk about it with others.

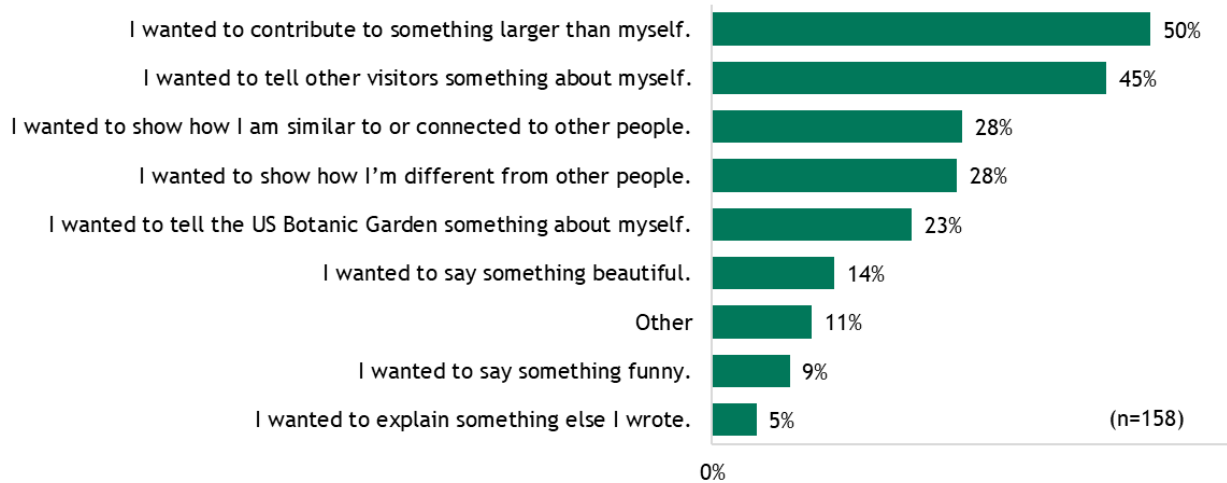
Figure 4: When you read the question, “What tastes like home?” which of the following things did you think about? (Check as many as apply.)



The question “What tastes like home?” made the majority of participants think of a type of food they like. Few thought about agriculture or USBG.





Figure 5. Think about what you wrote on your sticky note. Which of the following statements describe how you answered the question, “What tastes like home?” (Check as many as apply.)

When looking at respondents socio-personal message, most wanted to say something “larger than themselves” or to tell other visitors something about themselves.







Many participants reported strong feelings of relatedness at each stage of the experience. None reported feeling very alone and not cared about.

Table 16: Made me feel... (Relatedness)

	 Very connected, cared about and caring	 Somewhat connected, cared about and caring	 A bit alone and not cared about	 Very alone and not cared about
Reading the question (n=15)	67%	27%	7%	0%
Answering the question (n=130)	55%	45%	0%	0%
Seeing my sticky note on the wall (n=128)	59%	41%	1%	0%





Overall, participants reported feeling competent during the experience. But they were slightly less likely to feel like an “expert.”

Table 17: *Made me feel...* (Competence)

				
	Able to answer as an expert	Able to answer pretty well	Not able to answer as well as others	Not able to answer well at all
Reading the question (n=15)	33%	53%	7%	7%
Answering the question (n=130)	35%	64%	3%	1%
Seeing my sticky note on the wall (n=130)	43%	56%	1%	0%

Participants felt the highest level of autonomy seeing their sticky note on the wall. None reported feeling like they were forced to interact with the wall.

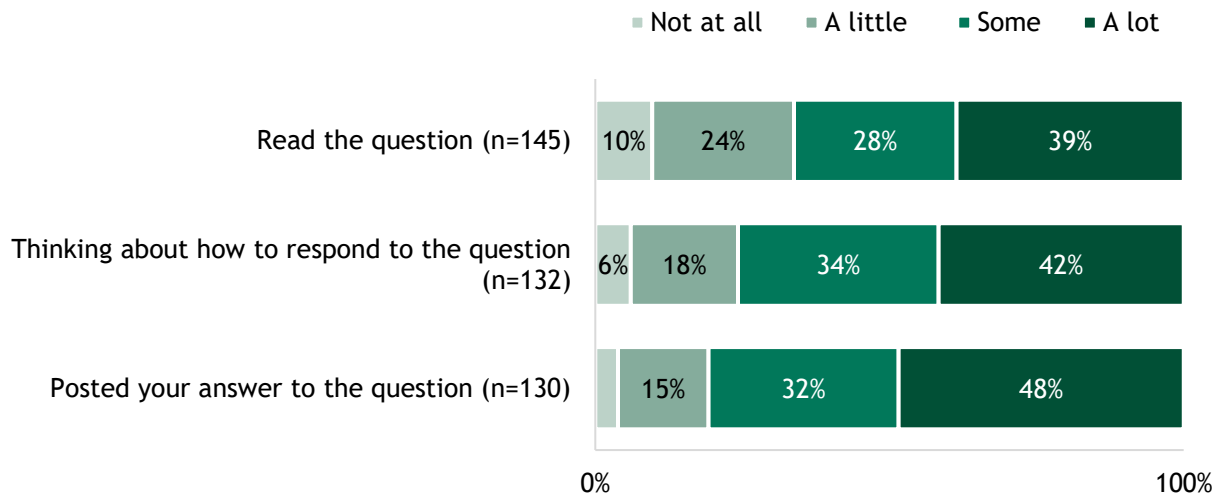
Table 18: *Made me feel...* (Autonomy)

				
	Excited about doing this	Doing this would be OK	I didn't know if I really wanted to do this	I would only do this because I was supposed to
Reading the question (n=15)	53%	47%	0%	0%
Answering the question (n=130)	43%	56%	1%	0%
Seeing my sticky note on the wall (n=128)	78%	22%	1%	0%

Emergent Experience

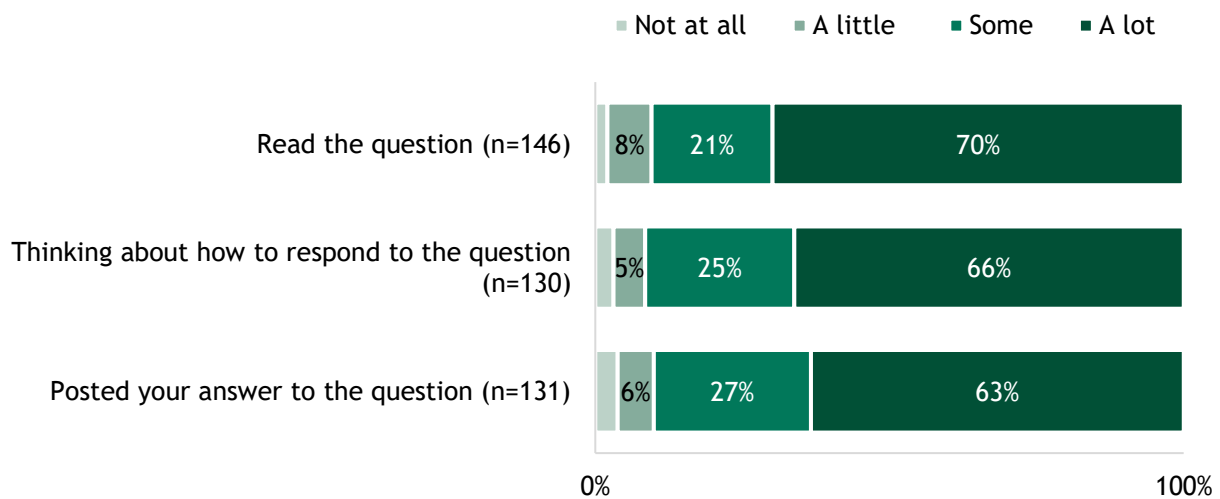
Half of the participants felt “a lot” unique when posting their response. One-third felt “not at all” or “a little” unique when reading the prompt.

Figure 6: How much did you experience “Feeling unique - like I had something to say”?



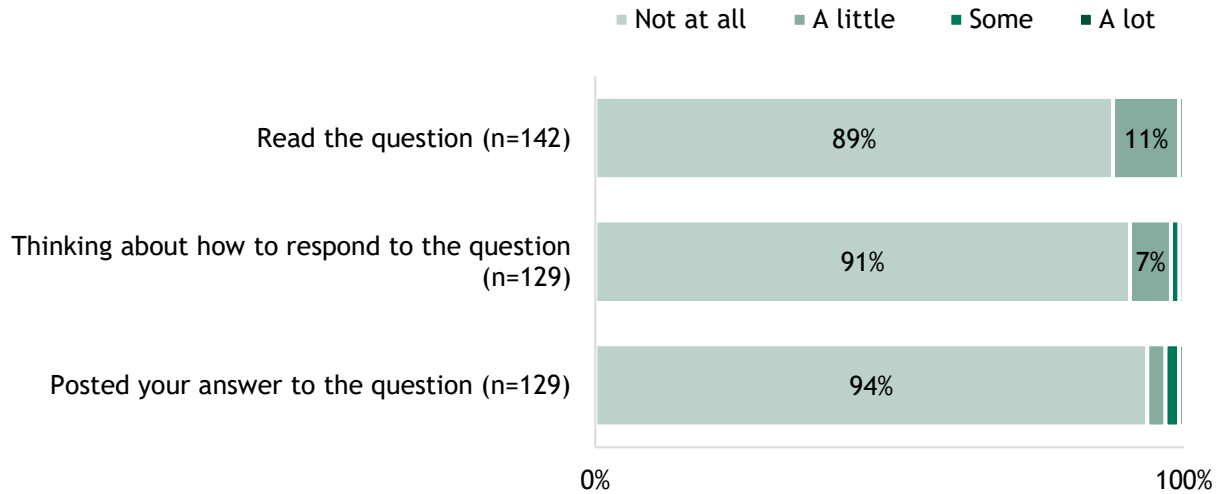
The majority of the participants felt “a lot” of nostalgia across the experience. Very few reported not feeling nostalgic as a result of the prompt.

Figure 7: How much did you experience “Feeling nostalgic - warmly in touch with something from my past”?



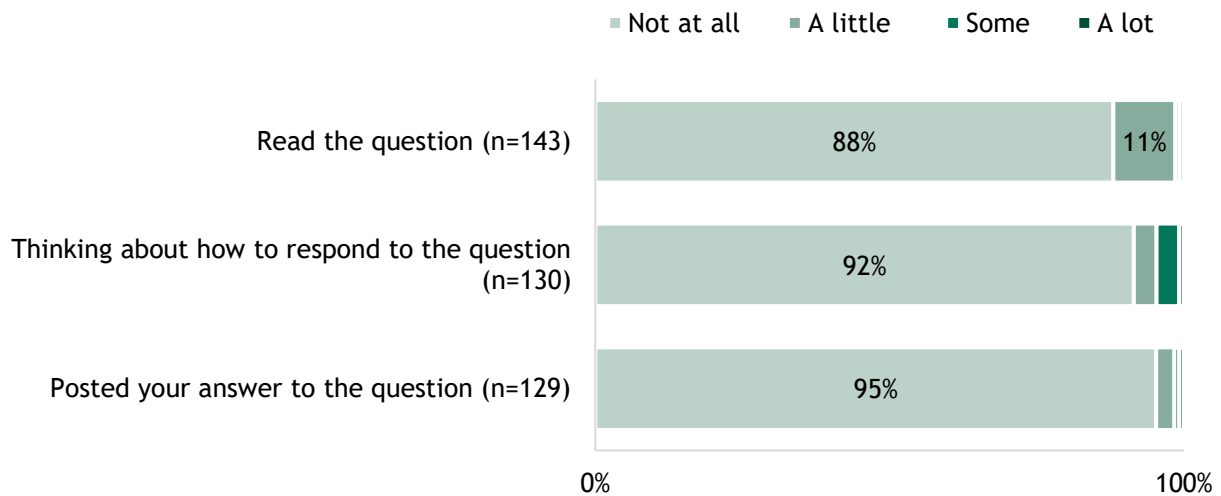
Most participants reported that they did not feel confused during the experience. A few reported “a little” confusion reading the prompt and responding.

Figure 8: How much did you experience “Feeling confused”?



Most participants reported that they did not feel overwhelmed at any stage of the experience. A few reported feeling “a little” overwhelmed reading the prompt.

Figure 9: How much did you experience “Feeling overwhelmed”?



Sense of inclusion

On average, participants felt a moderately strong sense of belonging and ability/encouragement to be themselves.

Table 19: Average responses to sense of inclusion subscales.

By posing the question, “What tastes like home?” the United States Botanic Garden... encourages my sense of belonging and my being able to be me.

Sense of Belonging	Authenticity (Able to be me)
Average = 3.95 (s.d.= .98)	Average = 4.18 (s.d.=.92)

Interview Responses and Themes

Interview data generally provided richer detail about visitors’ experiences with the response wall, as well as clarifying data related to interviewees’ questionnaire responses. Here, we inventory the frequency with which certain ideas appeared in interviews (n=63); all reported themes were mentioned by at least five individuals. As described above, the interview protocol invited respondents to first share the content of their sticky note, then describe their immediate thoughts at different moments during their experience with the sticky note response wall: when they first encountered the question, as they considered their answer, and when they posted their sticky note on the wall.

When explaining what they wrote on their sticky note, interviewees most often focused on the content of their answer to the question, “What tastes like home?” Many interviewees described people when discussing their sticky notes. When asked what they wrote about and why, interviewees gave answers that reflected content codes for people (33 respondents), names of foods (23), cultural traditions (23), geographic locations (22), processes of food preparation (20), ages or life stages (19), and agriculture (9). In addition, 19 interviewees gave responses that referred to identity membership (one of our communications codes). While interviewees generally did not speak directly about motivation in response to this question, some invoked motivation codes in their answers, referring to feelings that met our definition of relatedness satisfaction (21) and expressions of nostalgia (18).

When asked about their first thoughts upon encountering the question, “What tastes like home?” interviewees often focused on topics related to motivation, especially feelings of nostalgia (27) and a sense of relatedness to others (21). Other ideas reflected expressions of uniqueness (18), a sense of autonomy (13), a sense of competence (8), or, alternately, feeling a lack of competence (5). Some interviewees also continued to discuss the content of potential answers, referring to names of foods (15 respondents), geographic locations (15), people (12), their experience at USBG (12), ages or life stages (11), cultural traditions (8), and processes of food preparation (8). In addition, six interviewees also referred to membership in specific identity groups.

When asked about their experience of and immediate thoughts about answering the question, “What tastes like home?” participants focused on motivation. Especially prominent themes involved feelings and intentions related to uniqueness (28) and nostalgia

(22). Themes related to motivation also illustrated satisfaction and frustration of respondents' basic psychological needs, as follows:

- satisfaction - relatedness (17)
- satisfaction - autonomy (14)
- frustration - autonomy (12)
- frustration - competence (10)
- satisfaction - competence (8)
- frustration - relatedness (7)

Content codes also remained prominent, and nearly half of those interviewed (31) shared general positive sentiments. Other content themes present included references to people (20), names of foods (18), ages or life stages (16), cultural traditions (12), geographic locations (10), and processes of food preparation (7). Six respondents expressed a general negative sentiment. Responses to this question also included some communication codes, and particularly membership in identity groups (17) and explanations of sticky note content (8).

When asked about posting their sticky note on the wall, participants focused on the mechanics of how they engaged, with special emphasis on reading and comparing other visitors' sticky notes (33 respondents). Twenty interviewees described looking at the interactive wall as a whole (20), while others compared their submission to previous visitors' sticky notes (19) or expressed a desire for others to see their sticky note (18). Ideas that reflected our motivation codes also appeared prominently in responses to this question, indicating satisfaction of respondents' basic psychological needs for relatedness (33), competence (15), and autonomy (15), as well as feelings of uniqueness (12) and nostalgia (5). Respondents also gave responses that reflected content codes for names of foods (12) and geographic locations (11), as well as our communication code for membership in identity groups (8).

The latter half of the interview protocol focused on what aspects of the sticky note response wall supported and frustrated respondents' basic psychological needs. **A strong majority of interviewees reported that the activity supported their sense of competence (54 respondents), relatedness (58 respondents), and autonomy (58 respondents).**

When asked to elaborate on what supported their sense of competence, these visitors frequently referred to the **clarity and/or simplicity of the prompt** (13 respondents), observed that responses were **subjective** (10 respondents), and described an opportunity to express **something they personally related to or saw as important** (10 respondents). The seven respondents who expressed need frustration in relation to competence generally described challenges in choosing what to write - to write something interesting or "good," to express their identity well, or to choose between many possible answers.

Interviewees who expressed need satisfaction in reference to relatedness most frequently described **feeling connected to others who left a response** (32 respondents), **reading and comparing other sticky notes** (24 respondents), **comparing their own sticky notes** to those of others (11 respondents), and having an **opportunity to contribute** (11 respondents). Meanwhile, the two respondents who expressed need frustration in reference to relatedness reported experiences of seeing their sticky notes removed from the wall. However, both *also*

expressed need satisfaction in relation to the activity and the opportunity to discuss their experiences with it.

Interviewees who reported that the response wall supported their sense of autonomy most frequently described feeling **interested in the task and happy to participate** (15 respondents) and **appreciating the opportunity to contribute** (10 respondents.) The single respondent who expressed need frustration in relation to autonomy described it in terms that also connected with competence - i.e., feeling pressure to “have the perfect answer.”

The last question we asked interviewees was why they thought USBG included the response wall as part of their experiences. In response, interviewees shared a variety of answers.

When asked about why they think USBG included the prompt, interviewees shared a variety of answers, and many connected the response wall to their broader experience at the Garden. Interviewees were most likely to share responses about the relationship between people and plants (26). They also connected the prompt to the larger *Cultivate* exhibit, noting how it reinforced learning or ideas from the exhibition (18), as well as connecting it to other parts of USBG (8). Interviewees sometimes shared responses related to the potential for connections to be made through the response wall sticky notes, highlighting connections between different cultures (13) and people (3), as well as general senses of interconnectedness (9). Other themes included ideas about the visitor experience of a response wall, particularly interactivity as a strategy for engagement (7). A few interviewees specifically suggested intentions for promoting diversity (5) and inclusion (5), and a few thought the Garden might be using the wall to collect data about their visitors (4) or to inform USBG’s work (4).

fsQCA Results

For each of the four models tested (described above), combinations of conditions were identified as pathways when at least 80% of the cases that exhibited the combination of conditions also shared the outcome. The calibration table, truth tables, and necessity and sufficiency tables for each model can be found in Appendix E. Models 1 and 2 sought to determine pathways to both the presence and absence of sense of inclusion, among all respondents, both with and without the experience of posting a sticky note. The second two models, analyzed only on people with the experience of writing and posting a sticky note, sought to compare contribution of the two parts of the experience (responding to the prompt and posting the note) to basic psychological need satisfaction at these two points in the experience.

Model 1. Presence of high sense of inclusion among all responding visitors

Figure 10: Model 1, Three pathways to sense of inclusion.

	1 As Predicted	2 Contented	3 Already Included	
Highly need satisfied	+	+	~	Condition relative to pathway: <div style="background-color: #008000; width: 20px; height: 10px; margin-bottom: 2px;"></div> Mostly in <div style="background-color: #FFD700; width: 20px; height: 10px; margin-bottom: 2px;"></div> Mix of in and out <div style="background-color: #0000FF; width: 20px; height: 10px; margin-bottom: 2px;"></div> Mostly out
Highly unique	+			
Highly nostalgic	+	+	+	
Highly confused, overwhelmed				Solution coverage: 62% Solution consistency: 87%
Largely historically marginalized		~	~	
Did not post	~	~	+	
Count: 70	52%	35%	6%	

 Red rectangle highlights the finding that need satisfaction alone was not sufficient in any pathway. Nostalgia was present in all three pathways.

The model 1 solution revealed three pathways. We named them “the predicted,” “the contented,” and “the already included.” Participants in “the predicted” group, 52% of the 70 respondents who felt high sense of inclusion, followed our conceptual model. They felt highly need satisfied, posted a sticky note, and in the process, felt unique and nostalgic. A second group whom we called “the contented” felt high sense of inclusion without necessarily needing to feel like they had something special to say. Notably, people in this group were from mainstream, not historically marginalized populations. The third group, whom we labeled as “the already included,” only 6 percent of the sample, also were from mainstream populations, felt a high sense of inclusion, even though they did not participate in the sticky-note activity.

Across these pathways, **need satisfaction does not appear alone.** From this finding, we surmised that feeling competent, related, and autonomous alone is insufficient for feeling sense of inclusion. In this population, being highly nostalgic showed up across each of the pathways.

Contrary to our expectations the absence of confusion and overwhelm did not factor into any of the pathways to sense of inclusion.

Moreover, across these three pathways, although the proportion of people in the three pathways who also exhibited the outcome was high (87% consistency), the pathways only described 62% (coverage) of the cases that achieved the outcome. Thus, we recognize our model as sufficient for explaining some ways this type of exhibit (i.e., one that generates need satisfaction, sense of uniqueness and sense of nostalgia) lead to sense of inclusion, but insufficient for explaining sense of inclusion more generally.

Model 2. Absence of sense of inclusion among all responding visitors

Figure 11: Model 2, Six pathways to absence of sense of inclusion.

	Pathways			
	1	2	3	4
	One of the crowd	Outsiders	Confused	
Highly need satisfied	+			
Highly unique	~	~	~	
Highly nostalgic		~		
Highly confused, overwhelmed			+	+
Historically marginalized		+		~
Did not post				
Count: 77	31%	12%	12%	10%

Condition relative to pathway:

- Mostly in
- Mix of in and out
- Mostly out

Solution coverage: 49%
Solution consistency: 85%

 Red rectangle highlights the finding that need satisfaction -----.

The model 2 solution, pathways to the *absence* of sense of inclusion among all responding visitors, revealed six pathways but explained only 49% of the pathways for this group. In other words, there were conditions, unmeasured and outside of our model, that led to not feeling included. Despite this low coverage, the solution suggests that when conditions in the solution pathways co-occur, there is a good chance the outcome will also occur.

Our solution suggested that visitors with the following co-occurring conditions probably would fail to feel a sense of inclusion, i.e., a sense of personal authenticity and belonging.

The most common group of co-occurring conditions jointly consistent with absence of sense of inclusion, involved approximately 31% of the outcome and described respondents who felt highly need satisfied but not unique. We understood these two co-occurring conditions to mean that despite feeling competent, related and autonomous, being “**just one of the crowd,**” without something special to say

Visitors from historically marginalized populations who felt neither unique (without something to say) nor nostalgic in their interaction with the exhibit. We labeled this group as feeling like **outsiders**.

The next group described themselves as **highly confused or overwhelmed** along with being either from a marginalized population or not unique, that is, without something special to say (not unique).

We also noted that, contrary to our hypothesis (but in line with the QCA principal of asymmetry, see method description above), **the absence of need satisfaction did not show up in any of these pathways**. In fact, the presence of need satisfaction appears in the pathway most populated co-occurring with not feeling unique. This finding supports a conclusion from the first model (explaining the presence of sense of inclusion): need satisfaction alone does not help people feel included.

Note also that not feeling unique (i.e., “I don’t have anything special to contribute”) co-occurred in three pathways.

Confusion and overwhelm alone was not sufficient as a cause for not feeling included.

Model 3. Presence of sense of inclusion among visitors who posted a sticky note

Figure 12: Model 3, Pathways to sense of inclusion among posters only

	Pathways					
	1	2	3	4	5	6
Highly need satisfied when responding	+	~	~	+	+	~
Highly need satisfied when posting		~	~			+
Highly unique	+		+		+	
Highly nostalgic	+	+	+	+		
Highly confused and overwhelmed	~		~			
Historically marginalized		~	~			+
Count: 64	62%	30%	15%	44%	41%	30%

Condition relative to pathway:

Mostly in
Mix of in and out
Mostly out

Solution coverage: 70%
Solution consistency: 80%

Need satisfaction occurred primarily when responding rather than when posting.

When it was absent, which co-occurred with being historically marginalized, it was replaced by need satisfaction when posting.

Where need satisfaction when responding was not a factor and noticeably absent when posting, the other conditions all played prominently in the model: being unique, nostalgic and not confused or overwhelmed.

Among visitors from historically marginalized populations, feeling unique and nostalgic (without feeling confused and overwhelmed) replaced need satisfaction.

Model 4. Absence of sense of inclusion among visitors who posted a sticky note.

Figure 13: Model 4, Pathways to sense of inclusion among posters only.

	Pathways				
	1	2	3	4	5
Highly need satisfied when responding			+	~	~
Highly need satisfied when posting			~	+	~
Felt highly unique		~	~		~
Felt highly nostalgic		+	~	~	+
Felt highly confused and overwhelmed	+	+			
Historically marginalized	~			+	~
Count: 68	9%	12%	20%	10%	23%

Condition relative to pathway:

Mostly in
Mix of in and out
Mostly out

Solution coverage: 41%
Solution consistency: 90%

When viewed among only the 68 respondents who posted a sticky note, the absence if basic psychological need satisfaction shown to accompany absence of sense of inclusion in the whole population, occurred, in this smaller group, either when responding, when posting or at

both phases of the experience. Curiously where it was missing at one phase, it was prominently present (rather than a mix of in and out) at the other. In both these pathways feeling nostalgic was notably missing. When need satisfaction was missing in both phases, even the presence of nostalgia was not enough to lead to feelings of inclusion.

As with the model 3, among people from historically marginalized communities, need satisfaction when posting co-occurred with the absence of need satisfaction when responding.

Key fsCQA Findings

Based on the solutions to the four models we tested with fsQCA, we arrived at the following four Key findings.

1. Need Satisfaction (feeling competent, related and autonomous) was important but alone did not lead to sense of inclusion.

Most visitors who felt sense of inclusion also felt need satisfaction. However, many who felt need satisfaction did not feel sense of inclusion. **Need satisfaction needed to be accompanied by additional experience to lead to sense of inclusion**



2. Nostalgia drew people into feeling included, especially when they also felt competent, related, and autonomous.

3. Whereas feeling like they had something special to say or contribute (feeling unique) often was important to feeling included, **feeling not unique predictably led to feeling not included.**

4. A state of confusion and overwhelm can be OK under the right conditions. It was not OK for people who felt they had nothing special to say or people from historically marginalized populations.

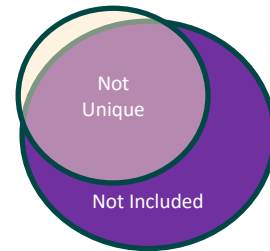
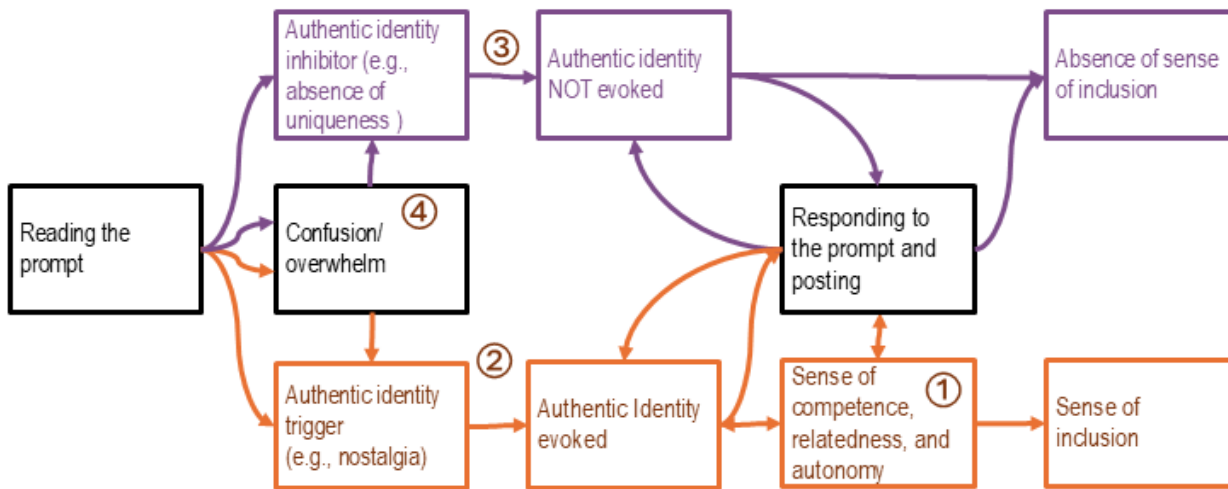


Figure 14: Revised model illustrating pathways from fsQCA analysis



This model illustrates the outcomes pathways that we observed among visitors in our study. While the orange pathway shows a sense of inclusion, the purple pathway shows absence of inclusion.

Feedback on Meaning Making with Collaborating Team

On February 10-11, 2025, the COSI team visited USBG to discuss results of to-date analyses with staff members at the Garden. This visit included meetings to share results with various internal audiences, as well as interpretive discussions with key personnel from the analysis team and the wider Learning & Engagement department. In these interpretive discussions, USBG learning and engagement practitioners (educators, floor staff, etc.) sought to contextualize the study data and findings with their knowledge of the *Cultivate* exhibition, visitor experiences at USBG, and public gardens more generally. Team members also sought to generalize the research study’s conceptual model (see Figure 1) beyond this specific exhibit experience, applying the concepts of uniqueness, nostalgia, overwhelm, and basic psychological need satisfaction along with the relationships between these concepts, to other informal learning contexts.

Team members also provided input about visitor experience elements at the Garden - whether in *Cultivate* or elsewhere - that can additionally contribute to specific feelings the respondents described experiencing with the “What tastes like home?” response wall. When talking about confusion and overwhelm, USBG staff hypothesized that certain areas (e.g., the Tropics section of the Garden) might feel overwhelming due to their size and the number of different plant species present. One staff member reflected that it might be easier for visitors to walk away with a specific feeling (e.g., relaxation, appreciation of beauty) than informational content, especially when crowding along paths discourages lingering at signs. Another observed that many people seem more connected to flowers than green plants and

wondered if areas with more focus on greenery might contribute to more confusion for this reason.

Team members brainstormed about what visitors might encounter at the Garden that could make them feel unique or not unique, and in doing so, they offered examples of times visitors identified plants to which they had some existing relationship (e.g., having grown that type of plant or having seen it somewhere else). Some team members also reflected on ways that they have encouraged visitors to share more about these experiences and connections, particularly in situations where they might be looking for a plant that is not in USBG's collection.

USBG team members also reflected on what might support or detract from basic psychological need satisfaction. Here, they considered that some policies and rules, despite being important to safety, might frustrate visitors' autonomy and/or relatedness during their time at the Garden. They also noted that basic uncertainty about wayfinding, rules, and other elements of the visitor experience could contribute to frustration of visitors' sense of competence, and that the fact of the Garden being a common destination for field trips and vacations might mean some people are there for reasons other than their own choice making. Conversely, USBG personnel also enumerated ways that positive conversations between them and visitors - in the form of greetings, explanations, invitations, etc. - were likely an important strategy for supporting basic psychological need satisfaction at the Garden. The team also gathered ideas about design choices that could support visitors. Team members drew attention to ways that areas for rest (e.g., benches and alcoves) might be important to mitigating confusion and overwhelm, especially at times with significant crowding. They also noted that the placement of experiences like interactive response walls, should allow visitors to linger long enough to fully participate in thoughtful consideration of their own and others' responses. In terms of design principles for the interactive response activity itself, USBG personnel highlighted the importance of ensuring physical and linguistic accessibility, asking a question that could invite visitors to choose what to share about themselves, and considering ways to encourage engagement with other visitors (e.g., by making sure the wall always has some responses on it).

Meaning Making with External Informal Education Practitioners

In addition to engaging USBG team members with the research results, we also sought feedback from other practitioners. In response to a presentation of the conceptual model and key findings from this study (Wasserman et al., 2025) science center colleagues attending the Association of Science and Technology Centers annual meeting (September 5-8, 2025) provided important feedback. This included commentary about both the validity of and application of the research model (**Error! Reference source not found.**). The examples below provide an understanding of how the model applies or can apply more generally to response walls.

Colleagues supported the model with **examples of their “favorite, most effective” response wall**. First, many of their examples illustrated ways response walls can draw from and generate sense of competence, relatedness and autonomy:

- Adding “pocket” to the prompt, “What’s in your bag/purse/pocket?” provided a greater frame of reference for a prompt accompanying an exhibit about the history of purses and handbags.
- To reflect on ten years of a guest experience “service corner,” a response wall prompt asked employees “What is your favorite part of the job?” This prompt seemed to generate a sense of competence, but also a sense of relatedness when people could write about caring and being cared about.
- Sense of relatedness can occur when a response wall provides the opportunity for people who already know each other to learn more about what each other had to say. In one example, a wall asking seminar participants to post their feelings about the seminar experience generated warmth and closeness.
- At a children’s museum, a prompt for visitors invited them to “leave a kind note for others” and “take a note if you need a kindness.”
- Colleagues noted that many of these response walls further generated sense of relatedness by creating both facilitated and unfacilitated conversations among or within groups of respondents.

One colleague summed up how a response wall can satisfy basic psychological needs::

[a response wall prompt that] asked for something that did not need expert knowledge to answer. The content was easy to relate to and something familiar. Gave space to share something they cared about and something that didn’t have right or wrong. It was their story. (ASTC session participant)

To enhance sense of competence, colleagues also referenced response walls with a facilitator to help people feel more competent at the response wall. An additional way of generating sense of competence has been to engage visitors in a discussion prior to encountering the response wall.

Colleague response also supported our finding that **basic psychological need satisfaction alone is insufficient for creating sense of inclusion**. For example, after responding to the “What tastes like home?” question, one colleague responded, “connection to the food as part of my identity [came first], competence second.” these colleagues also provided the following examples of response walls that generated either uniqueness, nostalgia, or some other quality filled out the experience.

- The colleague who presented the bag/purse/pocket example also noted the sense of uniqueness/specialness people felt when they could identify the unusual or even mundane contents of what they were carrying.
- The astronomy center colleague who described a response wall asking seminar participants about their feelings noted that the prompt generated nostalgia.
- The prompt “What will you miss with the changing climate?” utilized nostalgia as a vehicle to raise awareness and personal connection in a climate change exhibit.

- A technology-assisted response wall where young people create their own fish, attach their name, and see it join the school of fishes on the wall was described as generating sense of uniqueness (having something special to say).
- Another example cited as generating a sense of uniqueness or having something special to say was a response wall at an American history museum that asked “Where were you when it happened?”
- An example cited from The Exploratorium invites visitors to complete three parts of a sentence: “Because I’m _____, people think _____, but really, _____.” A corollary asks them to complete a second sentence: “Because some people _____, I think _____, but really, _____.” The colleague who presented this example explained its very deep connection to sense of uniqueness/specialness, saying, “it’s literally about some aspect of [respondents’] personal makeup... and the common [experience of being] misunderstood—it also taps into being competent in an area where people underestimate you.” This example seems to tap into permission for people to experience their authentic identity directly.

Equally important was **input that could serve to expand our research model**. Some colleagues provided examples of response walls that bolstered basic psychological need satisfaction with elements beyond nostalgia and uniqueness. These elements included generating warm/happy memories (even if not expressing the yearning nostalgia implies) in the case of the response wall that asked employees to reflect on their favorite part of their job. Another example was in a weather exhibit in which the prompt elicited stories that may have been scary or unpleasant at the time but were now important and even “fun” to share. Another colleague pointed out more generally that “talk back boards are successful that make people feel safe, smart, and valued. Outside of uniqueness and nostalgia this sense of safety may be a characteristic that could be further explored.

In more general comments on what makes a response wall or interactive exhibit successfully inclusive, colleagues addressed the importance of exhibit context. For example, they discussed the issue of whether a given context encourages interaction - e.g., where it is placed, and the interactivity encouraged in the rest of the museum. Along similar lines, colleagues spoke of the importance of visitors experiencing prompt questions as generating dialogue rather than being a quiz, and helping visitors feel “safe, smart, and valued.”

Colleague responses also identified potential directions for future research. For example, one colleague questioned if generating nostalgia is specific to older audiences, how similar feelings might be elicited from children. Discussions about context, and generalizability to exhibits also suggest rich opportunities for further study.

These comments, along with attendees’ other examples of creating sense of uniqueness and nostalgia, leads to important questions about our research model. First, and most basic, in what ways can response walls and exhibits and informal learning environments more generally support visitors’ basic psychological needs for sense of competence, relatedness, and autonomy? Second, what ways can these experiences tap into visitors’ sense of inclusion (being able to be their authentic self and sense of belonging) through experiences of nostalgia (sentimental longing), and feeling like they have something important to say (uniqueness)? Third, if basic psychological need satisfaction is insufficient for generating sense of inclusion,

what experiences beyond nostalgia and uniqueness bolster basic psychological need satisfaction?

Answers to the Research Questions

1: Interpreting and responding to the “What tastes like home?” question

Our first research question engaged the ways that visitors to USBG made sense of the interactive response wall and what seemed to inform their responses. The full text of this research question was as follows:

1. Within the context of the USBG’s exhibit, *Cultivate: Growing Food in a Changing World*, how do people respond to the question, “What tastes like home?” and why do they respond that way?
 - a. How do people interpret the question, “What tastes like home?”
 - b. What aspects of their identities/experiences do people deem relevant to the question?
 - c. What kinds of experiences and responses emerge from this question?
 - d. What processes lead to the responses?
 - e. What contexts inform the responses (social, environmental, etc.)?

Visitors’ literal sticky note responses to the question, “What tastes like home?” aligned strongly with the project team’s expectations, in that they largely reflected names or categories of foods. Both questionnaire and interview data illustrated that the specific foods people chose held connections to elements of their personal histories and identities, such as people and places that were important to them, cultural heritage, and specific times in their lives. In reflecting on how they made sense of the question, interviewees consistently described these elements as salient to responding.

Notably, visitors’ interpretation of how to answer the question often meant some deliberation for them, and some interviewees talked about their process of choosing between many possible options. In doing so, they sometimes spoke about trying to select the choice that would be *most* emblematic of their identity, in some cases explicitly describing their goal of being understood by others who shared elements of that identity, or to expand awareness of that identity among those unfamiliar. While their priorities varied, ethnicity and place were prominently described in terms of this type of conscious communication with other visitors. This type of asynchronous engagement with other visitors’ responses was also evident in interviewees’ descriptions of exploring the response wall as a whole, reviewing others’ responses, and comparing their own response to other sticky notes they could see.

The emotional and cognitive experiences described by visitors also align well with the idea that autobiographical memory can serve as both a tool for defining and expressing identity and a way of supporting basic psychological need satisfaction. Both questionnaire and interview data suggested that accessing feelings of nostalgia and uniqueness were frequent elements of the overall experience of engaging with the response wall. In addition, the acts of considering the question, answering the question, and sharing one’s answer all largely seem to have supported basic psychological need satisfaction, or feelings of relatedness, competence, and autonomy. Furthermore, for many, the invitation to respond made people feel connected to others and allowed them to draw on their own autobiographical knowledge

in a way that they could control and without fear of being “wrong.” This seemed to result in visitors reaching for responses that were largely consistent in terms of their style (i.e., the framing and approach of their responses) but widely varied in their literal content (i.e., the specific ideas they wrote down).

Basic psychological need satisfaction was common among respondents, and it was important to feelings of inclusion among visitors. However, our fsQCA exploration revealed that satisfaction of visitors’ needs for competence, relatedness, and autonomy was not enough to arrive at feelings of inclusion. In this exhibit, feelings of nostalgia and uniqueness were also important contributors, and in context they seem to be supported by the combination of the opportunity to reflect on one’s own personal response and the opportunity to engage with the responses of others.

2. Insights for public gardens

Our second research question initiated exploration of how findings could apply specifically to public gardens. The full text of this research question was as follows:

- Q2. What might these insights mean for public gardens?
- a. In what ways do these responses and experiences reflect unique offerings of this exhibit, the public garden experience, and perhaps public gardens more generally?
 - b. In what ways do responses provide insight into quality engagement with public garden audiences?
 - c. What can other public gardens learn from our learning?

Questionnaire and Interview data provided little direct insight specific to gardens. Although one of every four questionnaire respondents said that they posted a sticky note to tell the Garden something about themselves, only 6% associated their sticky note response with their Garden visit. On the other hand, the application of our findings generated rich conversation among the USBG collaborating team.

Therefore, to answer these questions, we drew largely from team feedback to our questionnaire and interview results (See Data description and results/Meaning Making with Collaborating Team). Resonating with the conceptual model, team members applied it to other aspects of the Garden, identifying where they could enhance basic psychological need satisfaction and, nostalgia, and uniqueness/specialness. In the discussion of results, team members gravitated toward identifying visitor touchpoints where Garden practices could be enhanced and strategies for enhancing them. These practices involved ways of reducing confusion and overwhelm especially in the busiest parts of the garden. They identified opportunities for helping visitors feel competent, related and autonomous, nostalgic, and unique/special. These strategies involved increasing opportunities for visitors to identify existing relationships with plants—nostalgic or otherwise, and how, as visitor experience facilitators, they could related experiences. Reflection extended into how Garden policies support or inhibit need satisfaction.

Based on this generation of fruitful discussion, it is possible that this model can function as a tool for facilitating similar conversations among other public garden professionals. Within

USBG, the team can use the model to periodically review and scan practices as they occur across the garden generally and more specifically, within exhibits.

3 Insights for creating inclusive learning environments

This third research question focused on what the exhibition might reveal about creating inclusive learning environments. The full text of this research question was as follows:

3. What might these insights mean for creating inclusive learning environments in general?
 - a. In what ways do these experiences reflect conditions for inclusive learning environments?
 - b. What does evoking “home” do for visitors (cognitively, affectively, socially)?

The focus of this research on inclusion emerged from USBG staff’s experience of the response-wall exhibit. Visitors appeared to be engaged differently and more deeply with this activity than with similar response walls staff had previously experienced. The responses were more detailed, more personal, and more varied. The assumption of the study was that this deeper engagement would be associated with deeper sense of inclusion.

That assumption failed to hold true. Despite high engagement, half of the respondents (both measured as half of all study respondents or half of only those who posted a sticky note) reported experiencing minimal sense of inclusion. On the other hand, this even distribution allowed us to understand the experience of both groups: those who experienced sense of inclusion as well as those who experienced its absence. Generally speaking, among pathways to sense of inclusion, basic psychological need satisfaction was important, but not sufficient. Sense of competence, relatedness, and autonomy needed to be additionally accompanied by a combination of nostalgia and/or uniqueness—largely generated by asking people to reflect on their associations with the word “home.” Where sense of inclusion was present, so too was nostalgia.

The corollary was not true. The absence of nostalgia was not strongly associated with the absence of sense of inclusion. Among the pathways to feeling a sense of inclusion, the absence of sense of uniqueness was prominent. Notably, it was the case for visitors from both the most marginalized (non-Caucasian female) and the most non-marginalized (Caucasian male) populations.

These findings were supported by feedback about response wall experiences from other professionals in the field. Their examples of successful response walls largely followed the model while providing important insights into how broadly the model can be applied with varied strategies. The examples also provided strong evidence that, given content areas beyond associations with “home,” the list of experiences to accompany basic psychological need satisfaction, while necessary, reaches beyond the nostalgia and uniqueness elements of this exhibit’s model. Naming those contenders will be an interesting area of future research. Meanwhile, the findings of this study underscore the value of carefully considering not only how to support visitors’ basic psychological need satisfaction, but also their ability to contribute meaningfully and in the context of others’ responses.

Conclusions and Recommendations

Summary

A key contribution from this collaborative project is the finding that pathways to feelings of inclusion can be influenced by intentional choices about experience design. More specifically, this study suggests that when feelings of inclusion are a priority outcome, design choices that promote feelings of uniqueness and nostalgia and mitigate the potential for confusion or overwhelm are strategies that can support successful outcome achievement. Our engagement with practitioners beyond the immediate context of USBG also suggests that there may be other response vehicles that can be similarly supportive. In addition, prioritizing basic psychological need satisfaction appears to be important to feelings of inclusion, although it does not seem to generate these feelings on its own.

The process of implementing this project and interpreting its results with a range of contributors has also illuminated some practical considerations for people working in informal learning settings. We offer these reflections below to support future research and further work to create inclusive and supportive visitor experiences.

Collaboration

Given that a goal of this research has been to deliver findings that might be meaningfully applied to the practical work of designing inclusive visitor experiences, we built into our project design a series of touchpoints intended to keep practitioner and researcher voices in conversation at all stages. Therefore, in addition to responding to our core research questions, it is also useful to enumerate the outcomes of this collaborative work in documenting the larger project. In reflecting on this process, we offer the following observations:

- Involving both USBG and COSI personnel in the initial work to inform the project literature review meant that the deductive capture of our coding framework became more comprehensive and inclusive of more disciplinary knowledge bases. Since this framework became the organizing lens by which other data were gathered and analyzed, this early work was critical to thoroughly exploring our questions.
- The USBG team's early on-the-groundwork to gather sample sticky notes also allowed the COSI team to be as inclusive as possible of realistic visitor responses in the initial coding framework, so that our theoretical understanding of the data could remain a good "fit" for the practical realities of the experience throughout the project.
- On a practical level, the person-hours committed by both teams to tasks associated with data collection and analysis allowed for greater efficiencies in both the chronological time and financial resources required to complete the work associated with this large project; at the same time, having both teams actively engaged in the work of research meant that personnel had a more equal footing in understanding both the Garden context and the actual study data.

- Collaborative deliberation at every stage of analysis, reporting, and dissemination has supported alignment across the team about what is most important and useful to share and what ways of sharing it support the aims of the project and our colleagues in various professional communities.
- USBG personnel have shared that their involvement in this work has afforded them the opportunity to learn more about the technical processes of research and to help advocate for the importance of understanding and listening to visitors. Moreover, some report that their experiences have helped identify opportunities to elicit input from visitors in other areas of their practice.

Our experience reflects what scholars have written about research-practice partnerships, characterized as focusing on problems of practice and involving shared authority between researchers and practitioners (Coburn & Penuel, 2016). In contrast to more typical one-way “translation” of research to practice, this kind of joint **work** has shared question asking, meaning making and interpretation among researchers and practitioners (Penuel et al., 2015). In doing so, RPPs have produced enhanced **research use** (Rycroft-Malone et al., 2015)()

The success of collaborative research, has been viewed in the literature (Henrick et al., 2017) as encompassing the following five dimensions: Building trust and cultivating partnership relationships; conducting rigorous research to inform action, supporting the partner practice organization in achieving its goals, and producing knowledge that can inform educational improvements more broadly, and building the capacity of participating researchers, practitioners, practice organizations and research organizations to engage in partnership work. (Henrick et al., 2017)

Although each of these outcomes has been an intention of this research, evaluating its success requires more time and further study. However, there is initial evidence of promising progress for the USBG following this collaborative research project. At an organizational level, the project directly connected COSI researchers with USBG leaders and educators, expanding the USBG’s existing network of trusted research partners into the social science arena. Working alongside qualitative research experts contributed to USBG educators’ professional learning, building educators’ skills in data collection, qualitative analysis, and meaning-making. Some participating USBG educators have already applied their experience of conducting and analyzing interviews to new systematic site-based audience needs assessments and program evaluations. Finally, communicating about the project with other public garden professionals in formal conference presentations and informal conversations has provided an avenue for the USBG to connect with other research-interested colleagues and explore future opportunities to build a culture of social science research-informed practice in public gardens.

Limitations of the Research

Limitations of this research need to be acknowledged and documented. First, our selection of dates and respondents was not random. Selection bias may have affected our results. It is entirely possible that visitors who refused to participate may have had very different experiences from those reported here. Also possible is that on the two data collection weekends, visitors responded differently than at other times.

Also, this study focused on a single exhibit, making our findings impossible to generalize to other response walls, never mind other garden exhibits. As was illustrated with the response wall examples from other professionals, while the gist of our model seemed to resonate beyond this exhibit, other factors may be equally or alternatively as influential. This limitation was underscored by the low coverage of the solutions to our fsQCA models, especially those for the absence of inclusion.

Emerging guidelines for designing inclusive response walls

Based on the findings of our research we created four guidelines practitioners can follow when they create response wall experiences. We call these “emerging” because of they could change or be enhanced as this type of research is replicated across a broader range of response wall and other exhibit experiences. However, based on the feedback we received from other informal education professionals we offer guidelines to the field. They are reproduced in a more visually inviting form in the brief posted in Appendix F.

1: Help people feel cared for and caring, competent, and empowered to make choices

Why? Although it did not lead to feelings of inclusion on its own, a sense of relatedness, competence, and autonomy was important.

How? When we asked visitors about their experiences they pointed to specific design features.

Design for relatedness by inviting people to share their perspective and identity, allowing them to see other people’s responses, and prompting them to think about or interact with people they love.

Design for competence by framing questions in terms of a person’s own knowledge and experience (not “right” answers) and keeping the task of answering simple and intuitive.

Design for autonomy by allowing for choice wherever possible (e.g., in color of materials or location of response), welcoming personal expression like drawings and humor, and making space for people’s “true” selves.

2: Ask questions that evoke and show respect for personal memories or experiences

Why? Most people who felt competent, related, and autonomous also needed nostalgia (recalling and expressing their authentic self) to experience a sense of inclusion.

How? Visitors expressed nostalgia throughout the experience, but often as soon as they read the question. We recommend asking questions that invite people to think about something important to who they are.

3: Create an experience where everyone can feel special

Why? Feeling not unique (like they had nothing special to say or contribute) pushed people away.

How? Seeing what others had to say was affirming for some visitors. While some visitors worried about giving a “boring” answer, closer looking by the visitor often revealed responses that resonated with their own ideas. We suggest showcasing many types of response through some intentional curation of visitor (and even staff) responses.

4: Consider ways to support people through confusion and overwhelm

Why? Big questions can trigger big emotions, including anxiety about not knowing where to start. A state of confusion and overwhelm was okay for respondents under the right conditions, but it could be a negative experience for people who felt they had nothing special to say or for people from historically marginalized populations.

How? Visitors appreciated concrete examples and ample room to reflect without hurrying. Use what you know about your context to create emotional and physical space for people to process what else they have seen, what they are being asked, and how they might respond.

Recommendations for future research

First, and most basic, in what ways can response walls and, more generally, exhibits and informal learning environments support visitors’ basic psychological needs for sense of competence, relatedness, and autonomy? Second, what ways can these experiences tap into visitors sense of inclusion (being able to be their authentic self and sense of belonging) through experiences of nostalgia and feeling like they have something important to say (uniqueness)? Third, if basic psychological need satisfaction is insufficient for generating sense of inclusion, what experiences beyond nostalgia and uniqueness bolster basic psychological need satisfaction?

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Appendix A: Final Coding Framework

The first category identified for coding interview responses was **content codes**. These look at the topical meaning of a participant’s response.

Entrance Narrative		
Code	Sources	Use if:
<i>Name of food</i>	Inductive (specific foods)	Response references one or more specific foods. Can refer to something consumed as a whole food or a prepared dish that requires multiple ingredients.
<i>Geographic location</i>	Inductive (geographic location)	Response references a particular map location (e.g., region, city, state, country, or continent)
<i>Cultural tradition</i>	Inductive (occasion/time); Deductive (cf. “roots” in Somerville, 1997, lit on foodways as expression of identity)	Response refers to specific cultural practices or a general sense of heritage
<i>People</i>	Inductive (person/people) ; Deductive (cf. “heart” in Somerville; nostalgia)	Response refers to specific individuals or groups of people
<i>Age or life stage</i>	Inductive (age); Deductive (age as a factor in developing taste; autobiographical memory; nostalgia)	Response refers to a time in one’s life, including periods (e.g. “childhood”) and numerical ages (e.g. “20”).
<i>Material situation</i>	Inductive (reference to circumstance); Deductive (cf. “shelter,” “hearth,” “privacy,” and “abode” in Somerville)	Response suggests situationally-inflected experience of home and/or food (e.g., family labor dynamics, access to resources, housing conditions)
<i>Commercial brand of food</i>	Inductive (commercial brand)	Response includes a name brand associated with a food product or dining
<i>Food preparation</i>	Inductive (food preparation); Deductive (lit on act of making food as identity-related practice)	Response includes reference to cooking, preparing, or serving food
<i>Agriculture</i>	Inductive (growing food)	Response includes reference to cultivating whole foods or ingredients

Garden context		
Code	Sources	Use if:
<i>USBG content</i>	Inductive (visitor content suggestion); Deductive (Evidence of voice: suggestions/criticisms)	Response includes explicit commentary about the content of the <i>Cultivate</i> exhibit area or USBG broadly
<i>USBG experience</i>	Inductive (visitor experience suggestion); Deductive (Evidence of voice: suggestions/criticisms)	Response includes explicit commentary about what it is like to experience the <i>Cultivate</i> exhibit area or USBG broadly
<i>General positive</i>	Inductive (general positive)	Response suggests positive affect with no clear referent
<i>General negative</i>	Inductive (general negative)	Response suggests negative affect with no clear referent
<i>General content</i>		Response engages the prompt but provides no specific or individualized information

The second category identified for coding responses was **communication codes**. These look at what communication is happening.

Code	Sources	Use if:
<i>Explanation</i>	Inductive (explanation or translation); Deductive (lit on uniqueness)	Response includes effort to clarify, explain, or translate for a reader
<i>Translingual communication</i>	Inductive (multiple languages)	Response contains text OTHER than the name of a food that is in a different language from the English prompt
<i>Date</i>	Inductive (date)	Response contains indicator of when the response was written
<i>Signature</i>	Inductive (examples of names on sticky notes); Deductive (lit on uniqueness)	Response appears to include author's name
<i>Image</i>	Inductive (included a drawing)	Response includes any form of drawings (e.g., illustrations, affective symbols like smiley faces, decorative flourishes on text)

<i>Reference to pop culture</i>	Inductive (pop culture references)	Response reflects a phrase or idea intended to connect a reader to popular culture (e.g., a line from a movie, song, or television show)
<i>Identity membership</i>	Inductive (team slogans, reports of where people live, etc. on sticky notes); Deductive (lit on uniqueness)	Response expresses clear affiliation with any kind of group (e.g. sports teams, state pride, ethnicity, specific family, heritage community)
<i>Irony</i>	Inductive (irony)	Response contains overt joke structure and/or clues that the response was not intended seriously
<i>Multiple authors</i>	Inductive (multiple authors)	Response appears to reflect input from multiple individuals (e.g. variable handwriting, attribution to several names or collective group)
<i>Social connection</i>	Inductive (included direction or reference to online interaction)	Response contains some kind of invitation to engage with the author or response beyond the immediate context (e.g. following them on social media)
<i>Eye dialect</i>	Inductive (eye dialect)	Response contains language intended to suggest a spoken accent
<i>Poetic description</i>	Inductive (examples found following deductive exploration of uniqueness)	Response leverages or extends simile in prompt (“what tastes like home”) or otherwise suggests an attempt at aesthetic expression

The third category identified for coding responses was **motivation codes**. These codes look at respondent’s basic psychological need satisfaction.

Emergent Experience		
Code	Sources	Use if:
<i>SDT.Comp.S</i> (<i>Competence – Satisfaction</i>)	Deductive – literature and past CRE projects	Response suggests author’s experience of feeling able to act successfully Think: feeling capable, feeling skilled, feeling knowledgeable, demonstrating knowledge or skill (e.g., language, recipes, cultural norms)
<i>SDT.Comp.F</i> (<i>Competence – Frustration</i>)	Deductive – literature and past CRE projects	Response suggests author’s experience of feeling unable to act successfully Think: feeling stupid, feeling ineffective, feeling of not understanding
<i>SDT.Rel.S</i> (<i>Relatedness – Satisfaction</i>)	Deductive – literature and past CRE projects	Response suggests author’s experience of feeling cared for and caring toward others Think: feeling like part of a group, feeling appreciated, feeling included, feeling considered, feeling like something is “for” you
<i>SDT.Rel.F</i> (<i>Relatedness – Frustration</i>)	Deductive – literature and past CRE projects	Response suggests author’s experience of feeling left out, lonely, or disconnected from or disrespected by other people
<i>SDT.Aut.S</i> (<i>Autonomy – Satisfaction</i>)	Deductive – literature and past CRE projects	Response suggests author’s individual self-regulated choice-making (free from pressure, tension, or ambiguity) Think: feeling excitement or joy about doing something, feeling that doing something is worthwhile or valuable, pride of ownership (e.g. adding one’s name)
<i>SDT.Aut.F</i> (<i>Autonomy – Frustration</i>)	Deductive – literature and past CRE projects	Response suggests author’s experience of pressure, tension, or ambiguity Think: feeling forced to do something, feeling like doing something is misaligned with who you are and what you want to do

Response Vehicles		
Code	Sources	Use if:
<i>Nostalgia</i>	Deductive-literature	Response implies a yearning for a familiar experience, especially one that is distant or not easily repeated. Note: May include diminishing language (e.g., suggestion of cheapness or negative class association that seems to suggest ownership/affection when contextualized)
<i>Uniqueness</i>	Deductive-literature	Response refers to a specific experience that is differentiated from others, especially by a personal claim to it, a sense of irreplaceability, or a sense of inaccessibility to others

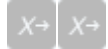
We also added some **mechanics codes** during the process of analyzing interviews. These inductive codes refer to features of the prompt activity.

Mechanics of participation
Code
<i>Interactivity</i>
<i>Reading/comparing other submissions</i>
<i>Comparing own submission to others</i>
<i>Looking at the wall as a whole</i>
<i>Desire for others to see their contribution</i>
<i>Opportunity to contribute</i>

Appendix B: USBG Visitor Questionnaire

The content below reflects the building logic for the study questionnaire as it appears on our survey platform, Qualtrics. Text in gray was not visible to respondents.

Start of Block: Refusal



Refusal Did the visitor agree to participate?

- Yes
- No

End of Block: Refusal

Start of Block: Refusal Notes

Refusal.Notes Notes

- No time/in a hurry
- Kids
- Hungry
- No English
- Didn't write a sticky note
- No thanks/don't want to
- Other: _____

End of Block: Refusal Notes

Start of Block: IRB language

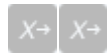
Q28 Thank you for your interest in this research! This questionnaire is part of a study called *What Tastes Like Home*, which is a partnership between the United States Botanic Garden and COSI's Center for Research and Evaluation. The goal of our study is to help places like public gardens better understand what they can do to create supportive, inclusive settings for learning. The questions will focus on your experiences with and feelings about a single open-ended prompt. It should take just a few minutes to complete. The questionnaire is voluntary and totally anonymous, and your participation is confidential. Your name won't be connected to your participation or your answers in any way. You may choose not to participate without any negative consequences to you, and there are no known risks to participating. Please feel free to stop the questionnaire if you need to. Thank you for contributing to this work! The *What Tastes Like Home* research team Questions? Feel free to reach out to our study leads: Deborah Wasserman (dwasserman@cosi.org) Dolly Hayde (dhayde@cosi.org) Laura Weiss (lweiss@cosi.org) *This study has been reviewed and approved by the Viable Insights Institutional Review Board (VIRB). The IRB has determined that this study meets the ethical*

obligations required by federal law and human-subjects standards set forth by the U.S. Department of Health & Human Services, Office for Human Research Protections. If you have questions or concerns regarding this study, please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator: Phil Stoeklen, M.S. VIRB 1677 S. Research Loop Tucson, AZ 85710 715.931.0695 virb@viableinsights.com **By clicking the arrow below, I indicate that I have read the above information, had the chance to ask questions and receive answers, and I consent to take part in the *What Tastes Like Home* study.**

Page Break

End of Block: IRB language

Start of Block: Did



did In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)

- Considered the prompt
- Read sticky notes
- Wrote a sticky note
- Talked about what others wrote on sticky notes
- Talked about what you wrote on a sticky note
- Talked about the prompt itself

End of Block: Did

Start of Block: Think/Feel/Describe



saw.think When you read the question, “What tastes like home?” which of the following things did you think about? (Check as many as apply)

- A type of food I like
- A place I consider my home
- My cultural heritage
- A person or group I feel connected to
- A specific time in my life
- A restaurant or brand of food I like
- Cooking or preparing food
- Agriculture
- My experience at the US Botanic Garden today

Something else (please share):



read.feel When you read the question, “What tastes like home?” how much did you experience each of the ways of feeling below?

	Not at all	A little	Some	A lot
Feeling unique – like I had something special to say	0	0	0	0
Feeling nostalgic – warmly in touch with something from my past	0	0	0	0
Feeling confused	0	0	0	0
Feeling overwhelmed	0	0	0	0

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply) != Wrote a sticky note

why.not Which of the following statements best describes why you did NOT leave a sticky note at the wall?

- I didn't have enough time to respond.
- I could not think of anything to write.
- I had too many ideas to decide between.
- I wasn't interested in responding.
- Another reason: _____

Display this question:

*If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note*

think.feel When you were thinking about how to respond to the question, “What tastes like home?” how much did you experience each of the ways of feeling below?

	Not at all	A little	Some	A lot
Feeling unique – like I had something special to say	0	0	0	0
Feeling nostalgic – warmly in touch with something from my past	0	0	0	0
Feeling confused	0	0	0	0
Feeling overwhelmed	0	0	0	0

Display this question:

*If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note*

wrote.feel After you posted your answer to the question, “What tastes like home?” on the wall, how much did you experience each of the ways of feeling below?

	Not at all	A little	Some	A lot
Feeling unique – like I had something special to say	0	0	0	0
Feeling nostalgic – warmly in	0	0	0	0

touch with something from my past

Feeling confused

Feeling overwhelmed

0

0

0

0

0

0

0

0

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



describe Think about what you wrote on your sticky note. Which of the following statements describe how you answered the question, “What tastes like home?” (Check as many as apply)

- I wanted to tell the US Botanic Garden something about myself.
- I wanted to tell other visitors something about myself.
- I wanted to contribute to something larger than myself.
- I wanted to show how I am similar to or connected to other people.
- I wanted to show how I’m different from other people.
- I wanted to explain something else I wrote.
- I wanted to say something funny.
- I wanted to say something beautiful.
- Something else (please share):

End of Block: Think/Feel/Describe

Start of Block: SDT

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note

prompt.wrote The questions below are about the experience you had with the question, “What tastes like home?” We will ask you about two separate moments: 1. When you thought about and wrote your response to the question 2. When you posted your sticky note Please choose the answers that are most like the way you felt in these specific moments.

Display this question:

*If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
!= Wrote a sticky note*

prompt.didnot The questions below are about the experience you had when you read the question, “What tastes like home?” Please choose the answers that are most like the way you felt.

Display this question:

*If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
!= Wrote a sticky note*



read.relatedness Reading the question (“What tastes like home?”) made me feel...

- Very connected, cared about and caring
- Somewhat connected, cared about and caring
- A bit alone and not cared about
- Very alone and not cared about

Display this question:

*If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
!= Wrote a sticky note*



read.competence Reading the question (“What tastes like home?”) made me feel...

- Able to answer as an expert
- Able to answer pretty well
- Not able to answer as well as others

- o Not able to answer well at all

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
!= Wrote a sticky note



read.autonomy Reading the question (“What tastes like home?”) made me feel...

- o Excited about doing this
- o Doing this would be OK
- o I didn’t know if I really wanted to do this
- o I would only do this because I was supposed to

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



answer.relatedness Answering the question “What tastes like home?” made me feel...

- o Very connected, cared about and caring
- o Somewhat connected, cared about and caring
- o A bit alone and not cared about
- o Very alone and not cared about

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



answer.competence Answering the question “What tastes like home?” made me feel...

- o Able to answer as an expert
- o Able to answer pretty well
- o Not able to answer as well as others
- o Not able to answer well at all

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



answer.autonomy Answering the question “What tastes like home?” made me feel...

- Excited about doing this
- Doing this would be OK
- I didn't know if I really wanted to do this
- I would only do this because I was supposed to

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



see.relatedness Seeing my sticky note on the wall made me feel...

- Very connected, cared about and caring
- Somewhat connected, cared about and caring
- A bit alone and not cared about
- Very alone and not cared about

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



see.comptence Seeing my sticky note on the wall made me feel...

- Able to answer as an expert
- Able to pretty answer well
- Not able to answer as well as others
- Not able to answer well at all

Display this question:

If In the area with the question, “What tastes like home?” what did you do? (Check as many as apply)
= Wrote a sticky note



see.autonomy Seeing my sticky note on the wall made me feel...

- Excited about doing this
- Doing this would be OK
- I didn't know if I really wanted to do this

- o I would only do this because I was supposed to

End of Block: SDT

Start of Block: USBG



USBG By posing the question, “What tastes like home?” the United States Botanic Garden...

	1 - Strongly Disagree	2	3	4	5 - Strongly Agree
...gives me the feeling that I belong here	0	0	0	0	0
...gives me the feeling that I am connected to other guests	0	0	0	0	0
...gives me the feeling that I fit in	0	0	0	0	0
...treats me as an insider	0	0	0	0	0
...seems to have designed this for me	0	0	0	0	0
...appreciates me	0	0	0	0	0
...seems pleased that I am here	0	0	0	0	0
...cares about me	0	0	0	0	0
...allows me to be authentic	0	0	0	0	0

...allows me to be who I am	0	0	0	0	0
...allows me to express my authentic self	0	0	0	0	0
...allows me to present myself the way I am	0	0	0	0	0
...encourages me to be authentic	0	0	0	0	0
...encourages me to be who I am	0	0	0	0	0
...encourages me to express my authentic self	0	0	0	0	0
...encourages me to present myself the way I am	0	0	0	0	0

End of Block: USBG

Start of Block: Demographics

group.comp **Are you visiting alone or in a group today?**

- Alone
- In a group

Display this question:

If Are you visiting alone or in a group today? = In a group

kids **Does your group include any children? (If yes, what are their ages?)** [Select all that apply]

- No

- Yes, child(ren) under 12
- Yes, child(ren) 12-17



born In what year were you born? Please enter four digits (Example: 1967).

residence Do you live in the United States?

- Yes. Enter Zip Code: _____
- No. Enter your country of residence:

race With which US Census racial or ethnic group(s) do you identify? Select all that apply.

- American Indian or Alaska Native
- Asian or Asian American
- Black or African American
- Hispanic, Latino, Latina, or Latinx/Latine
- Middle Eastern or North African
- Native Hawaiian or Pacific Islander
- White
- Multiracial
- Additional affiliation: _____
- Prefer not to answer

gender What is your gender identity?

- Female
- Male
- Non-Binary
- Prefer to self-describe: _____
- Prefer not to answer

End of Block: Demographics

Start of Block: ID and wrap-up

Q30 Thank you for completing this questionnaire! Please bring this tablet back to a member of our data collection team for a thank-you and a chance to share more about your answers.

Page Break

Q31 FOR RESEARCH TEAM USE ONLY: Assign match ID (m.dd.your initials.#):

Q32 NOTES

End of Block: ID and wrap-up

Appendix C: USBG Interview Questions

The content below reflects the questions we used with visitors to USBG who agreed to participate in an interview. These questions were asked immediately after a visitor completed the questionnaire (Appendix B).

ID (m.dd.your initials.#):

*Thank you! Now I'm going to ask you just a few more questions about your actual sticky note response. Again, your responses are anonymous and confidential. We will assign an ID number to link your questionnaire to your interview responses, but these will not be connected to your name. Just like before, we are not aware of any risks to you, your participation is voluntary, and you may stop at any time if needed. If you have any questions, we'll be happy to answer them, or we can direct you to the board that oversees our research. **With all that in mind, do you consent to being interviewed for this study?***

Q1 Please show me your sticky note(s). What did you write about, and why?

[Interviewer: Write content of sticky note(s) or content description(s) below.]

**Q2. Talk about your experience of first encountering the question, “what tastes like home?”
What were your first thoughts? What feelings did you have?**

Probes if not yet addressed:

What were you thinking or feeling about yourself?

What was it about the question that made you think or feel that way?

Q3. Talk about your experience of answering the question , “what tastes like home?” What were you thinking about? How were you feeling?

Probes if not yet addressed:

What were you thinking or feeling about yourself?

What was it about the question that made you think or feel that way?

Q4. Talk about your experience of posting your sticky note and seeing it on the wall with the others. What were you thinking about? How were you feeling?

Probes if not yet addressed:

What were you thinking or feeling about yourself?

What were you thinking about others who might read your note?

What was it about posting your sticky note that made you think or feel that way?

Q5. When people experience a task, they can feel competent and able on the one hand or incompetent and unable on the other. What else might you want to say about ways the “what tastes like home?” experience supported or challenged your sense of competence?

Q6. When people experience a task, they can feel related to others, that is they can feel caring and cared about on the one hand or disrespected and not cared about on the other. What else might you want to say about the ways the “what tastes like home?” experience made your feel caring or cared about? Or not caring and not cared about?

Q7. When people experience a task, they can feel free or pressured, that is they can feel like the what they’re free to be who they really are or on the other hand, that they’re feeling pressured to be someone they’re not. What else might you want to say about the ways the “What tastes like home?” experience made you feel free or pressured?

Q8. Why do you think the Garden included the prompt “What tastes like home?” and the response wall in the exhibit?

Appendix D. A Brief Explanation of fsQCA

Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a method designed to identify combinations of factors—called **conditions**—that contribute to the presence or absence of an outcome. Developed by Charles Ragin (2008), fsQCA combines **set theory** and **Boolean algebra** to analyze how different configurations of conditions lead to success (i.e., achieving the outcome), recognizing that outcomes in real-world settings are often shaped by complex and interacting influences (Fiss, 2011; Rihoux & Ragin, 2012).

FsQCA is particularly well-suited for understanding how **multiple factors interact** in unique ways for different participants. Rather than assuming one single best explanation, it recognizes **equifinality** (there's more than one way to succeed), **conjunctuality** (conditions work in combination), and **asymmetry** (the opposite of a successful pathway doesn't necessarily lead to failure), three core QCA principles (Ragin & Fiss, 2008).

This approach is especially useful in contribution analysis (Befany & Mayne 2014)—when the question is not if an intervention or activity was successful or unsuccessful, but instead, in what ways and under what conditions did parts of the activity contribute to an outcome (Befany, 2016; Wasserman et al., 2024). FsQCA helps identify both **necessary conditions** (factors always present when the outcome is achieved) and **sufficient combinations of conditions** (sets of conditions that can lead to an outcome, though not always exclusively; Schneider & Wagemann, 2012).

This qualitatively oriented methodology requires a shift from thinking about distributions around a mean or median (as when using inferential statistics) to overlapping sets of cases that meet predefined conditions. In other words, it looks for sets of conditions that overlap (think Venn diagram) with an outcome. Groups of independent variables—whether obtained through interviews or questionnaires or any other data source—can make up a condition or outcome calibrated in a way that each participating case can be determined to be fully in the set, fully out of the set, and in fuzzy set QCA, more in than out or more out than in. Sets are defined in terms of the qualities that make cases fully in.

For example, we created a set of visitors with a high sense of inclusion, which we defined scoring highly on both dimensions of the sense of inclusion scale (authenticity and relatedness as described above). Fully out of the set were visitors who scored low (less than 3.5) on both dimensions. We considered visitors who scored highly (>4.5) in one domain to be more in than out of the set, with the remainder (i.e., some combination of moderate and low scores) being more out than in. Definitions of the full set of calibrated conditions can be found in the Methodology/Analysis & Meaning Making/FsQCA/Calibration section of this report.

Key evaluation metrics in fsQCA include **consistency** (how reliably a configuration leads to the outcome) and **coverage** (how much of the outcome is explained by the configuration) (Ragin, 2014). These concepts function similarly to reliability and explanatory power in traditional statistics. For a more detailed explanation of consistency and coverage in our model, see Wasserman et al., 2024.

FsQCA has been applied across disciplines—including sociology, political science, education, and organizational psychology (Fiss et al., 2013; Rihoux et al., 2013)—and is increasingly

accessible due to advances in software and packages in R (Duşa, 2019; Oana & Schneider, 2024). In the fields of youth development and education, researchers have used fsQCA to examine emotional well-being (de la Barrera et al., 2019), program implementation (Goicolea et al., 2016), student motivation (Martí-Parreño et al., 2018), and more. Its flexibility and case-oriented logic make fsQCA a powerful tool for identifying what works, for whom, and under what conditions (Befani, 2016; Hill et al., 2019; Mello, 2021).

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Appendix E. fsQCA tables

Calibration Table

Outcome & Conditions	Code	Fully in (1.0)	Crossover between 0.7 and 0.3	Fully out (0.0)
Outcome: high sense of inclusion		Authenticity and belongingness average ≥ 4.5	Authenticity or belongingness average ≥ 4.5	Authenticity and belongingness average ≤ 3.5
Historically marginalized	A	Non-Caucasian, not-male	Race/Ethnicity	Caucasian, male
Felt highly unique	B	Average greater than 3.5	Average of 2.999	Average less than 2.0
Felt highly nostalgic	C	Average greater than 3.5	Average of 2.999	Average less than 1.0
Felt highly confused and overwhelmed	D	Average greater than 2.0	Average of 1.499	Average less than 2.0
Highly need satisfied	E	Average equals than 4.0	Average of 3.701	Average less than 3.0
Highly need satisfied when responding	F	Average equals than 4.0	Average of 3.701	Average less than 3.0
Highly need satisfied when posting	G	Average equals than 4.0	Average of 3.701	Average less than 3.0
Did not post a sticky note (crisp set)	H	Did not post		Posted

Table 1. Truth table associated with sense of inclusion among all respondents

A	B	C	D	E	H	Frequency	Outcome	PRI consist.
0	1	1	0	1	0	20 (14%)	0.89	0.82
0	0	0	0	0	0	18 (12%)	0.63	0.32
0	1	1	0	0	0	16 (11%)	0.80	0.62
1	1	1	0	0	0	14 (10%)	0.85	0.74
1	1	1	0	1	0	11 (7%)	0.91	0.85
0	0	1	0	0	0	11 (7%)	0.80	0.43
1	1	0	0	0	0	9 (6%)	0.66	0.50
0	1	0	0	0	0	6 (4%)	0.84	0.65

Note: A = historically marginalized, B = felt highly unique, C = felt high nostalgic, D = felt high confused and overwhelmed, E = highly need satisfied, H = did not post a sticky note = Outcome: presence and absence of high sense of inclusion. There were 2 combinations present for 4 cases, 2 combination present for 3 cases, 10 combinations present for 2 cases and 8 combinations present for 1 case also included in the analysis and the consistency cutoff was 0.88.

Table 2. Truth table associated with sense of inclusion among respondents who posted sticky notes.

A	B	C	D	F	G	Frequency
0	1	1	0	1	1	24(18%)
1	1	1	0	1	1	17(13%)
0	0	0	0	0	0	8(6%)
0	1	1	0	0	0	6(5%)
1	1	0	0	1	1	6(5%)
0	0	1	0	0	0	5(4%)
0	0	0	0	1	1	5(4%)
0	1	0	0	0	0	4(3%)
1	1	1	0	0	1	4(3%)
0	0	1	0	1	1	4(3%)
1	1	1	0	0	0	3(2%)
0	0	1	1	0	0	3(2%)
0	0	0	0	1	0	3(2%)
0	1	1	0	1	0	3(2%)
0	0	0	0	0	1	3(2%)
0	0	1	0	0	1	3(2%)
0	1	1	0	0	1	3(2%)

Note: A = historically marginalized, B = felt highly unique, C = felt high nostalgic, D = felt high confused and overwhelmed, F = highly need satisfied when responding, G=highly need satisfied when posting= Outcome: presence and absence of high sense of inclusion. There were 2 combinations present for 4 cases, 2 combination present for 3 cases, 10 combinations present for 2 cases and 8 combinations present for 1 case also included in the analysis and the consistency cutoff was 0.88.

Model 1. High Sense of Inclusion among Full Dataset

Table 3. Table of necessary condition analysis related to high sense of inclusion

Conditions	Presence	
	Consistency	Coverage
Historically Marginalized	0.46	0.59
-Historically Marginalized	0.61	0.54
Felt Highly Unique	0.81	0.70
-Felt Highly Unique	0.36	0.50
Felt Highly Nostalgic	0.83	0.65
-Felt Highly Nostalgic	0.32	0.52
Highly Confused or overwhelmed	0.14	0.65
-Highly Confused or overwhelmed	0.95	0.56
sNon-Posters	0.09	0.46
-Non-Posters	0.91	0.54
Highly Need Satisfied	0.64	0.80
-Highly Need Satisfied	0.64	0.58

Table 4. Sufficiency table for high sense of inclusion among full dataset (n=70)

	Pathways		
	1	2	3
HistoricallyMarginalized		~	~
FeltHighlyUnique	+		
FeltHighlyNostalgic	+	+	+
HighlyConfusedorOverwhelmed			
highlyneedsatisfied	+	+	~
Non-Posters	~	~	+
consistency	0.88	0.86	1.00
raw coverage	0.52	0.35	0.06
unique coverage	0.20	0.03	0.04
Number of cases with > .5 pathway membership	36	25	4

Solution consistency (0.87), Solution coverage (0.62)

Model 2. High Sense of Inclusion among Posters Only

Table 5. Table of necessary condition analysis related to high sense of inclusion among posters only

Condition	Presence	
	Consistency	Coverage
HistoricallyMarginalized	0.47	0.62
~HistoricallyMarginalized	0.58	0.54
FeltHighlyUnique	0.84	0.72
~FeltHighlyUnique	0.35	0.51
FeltHighlyNostalgic	0.83	0.65
~FeltHighlyNostalgic	0.31	0.55
HighlyConfusedorOverwhelmed	0.13	0.65
~HighlyConfusedorOverwhelmed	0.94	0.57
HighRespondBPNS	0.80	0.76
~HighRespondBPNS	0.49	0.62
HighSeeBPNS	0.85	0.72
~HighSeeBPNS	0.41	0.61

Table 6. Sufficiency table for high sense of inclusion among posters only (n=64)

	Pathways					
	1	2	3	4	5	6
Historically marginalized			+	~	~	~
Felt Highly Unique	+		+		+	
Felt Highly Nostalgic	+	+	+	+		

Highly Confused or overwhelmed	~		~			
High need satisfaction when responding	+	+		+	+	~
High need satisfaction when posting consistency		~	~			+
raw coverage	0.85	0.88	0.89	0.81	0.83	0.83
unique coverage	0.62	0.30	0.15	0.44	0.41	0.30
Number of cases with > .5 pathway membership	0.15	0.01	0.02	0.01	0.01	0.04
	40	19	10	28	26	19

Solution consistency (.78), Solution coverage (.77)

Model 3. Full set absence of inclusion

Table 7. Table of necessary condition analysis related to absence of high sense of inclusion

Conditions	Presence	
	Consistency	Coverage
HistoricallyMarginalized	0.18	0.75
-HistoricallyMarginalized	0.60	0.74
FeltHighlyUnique	0.49	0.73
-FeltHighlyUnique	0.82	0.67
FeltHighlyNostalgic	0.49	0.55
-FeltHighlyNostalgic	0.12	0.54
HighlyConfusedorOverwhelmed	0.64	0.52
-HighlyConfusedorOverwhelmed	0.43	0.49
Non-Posters	0.92	0.49
-Non-Posters	0.67	0.47
HighlyNeedSatisfied	0.88	0.46
-HighlyNeedSatisfied	0.60	0.45

Table 8. Sufficiency table for absence of high sense of inclusion among full dataset

	Pathways					
	1	2	3	4	5	6
HistoricallyMarginalized		+		~	+	
FeltHighlyUnique	~	~	~			+
FeltHighlyNostalgic		~				~
HighlyConfusedorOverwhelmed			+	+		
highlyneedsatisfied	+					
Non-Posters					+	+
consistency	0.88	0.87	1.00	0.85	0.75	0.86
raw coverage	0.31	0.12	0.12	0.10	0.06	0.03
unique coverage	0.19	0.04	0.01	0.02	0.03	0.02
Number of cases with > .5 pathway membership	24	10	9	7	4	3

Solution consistency (0.85), Solution coverage (0.49)

Model 4. Absence of High Sense of Inclusion among posters only

Table 9. Table of necessary condition analysis related to high sense of inclusion among posters only

Condition	Presence	
	Consistency	Coverage
HistoricallyMarginalized	0.47	0.62
~HistoricallyMarginalized	0.58	0.54
FeltHighlyUnique	0.84	0.72
~FeltHighlyUnique	0.35	0.51
FeltHighlyNostalgic	0.83	0.65
~FeltHighlyNostalgic	0.31	0.55
HighlyConfusedorOverwhelmed	0.13	0.65
~HighlyConfusedorOverwhelmed	0.94	0.57
HighRespondBPNS	0.80	0.76
~HighRespondBPNS	0.49	0.62
HighSeeBPNS	0.85	0.72
~HighSeeBPNS	0.41	0.61

Table 10. Sufficiency table for absence of high sense of inclusion among posters only

	Pathways				
	1	2	3	4	5
Historically marginalized	~			+	~
Felt Highly Unique		~	~	~	~
Felt Highly Nostalgic			~	~	+
Highly Confused or overwhelmed	+	+			
High need satisfaction when responding			+	~	~
High need satisfaction when posting			~	+	~
consistency	.82	1.0	.93	.91	.92
raw coverage	0.09	0.12	0.20	0.10	0.23
unique coverage	0.02	0.03	0.05	0.02	0.09
Number of cases with > .5 pathway membership	6	8	13	7	15

Solution consistency (.90), Solution coverage (.40)

Appendix F. WTLH “Recipes for Success” Brief



What Tastes Like Home? Recipes for Success in Developing Inclusive Sticky Note Response Walls

Our collaborative research project

The United States Botanic Garden (USBG) and COSI's Center for Research and Evaluation (CRE) studied USBG visitors' experiences with an interactive exhibit component where they could respond to the question, “What tastes like home?” by writing their own answer on a sticky note and attaching it to a large wall. We expect that our findings could be applicable to the development of visitor response walls in a variety of settings.

Theoretical perspective

Through a literature review of existing theory, to explain sense of inclusion, we developed a hypothesis and definitions to guide our study design.

Inclusion. Having a sense of belonging and the freedom to be oneself (experiencing authentic identity)

Basic Psychological Need Satisfaction (Self-Determination Theory)

- Competence: “I can be effective and achieve my goals.”
- Relatedness: “I care about others; they care about me.”
- Autonomy: “My choices and actions align with my personal interests and values.”

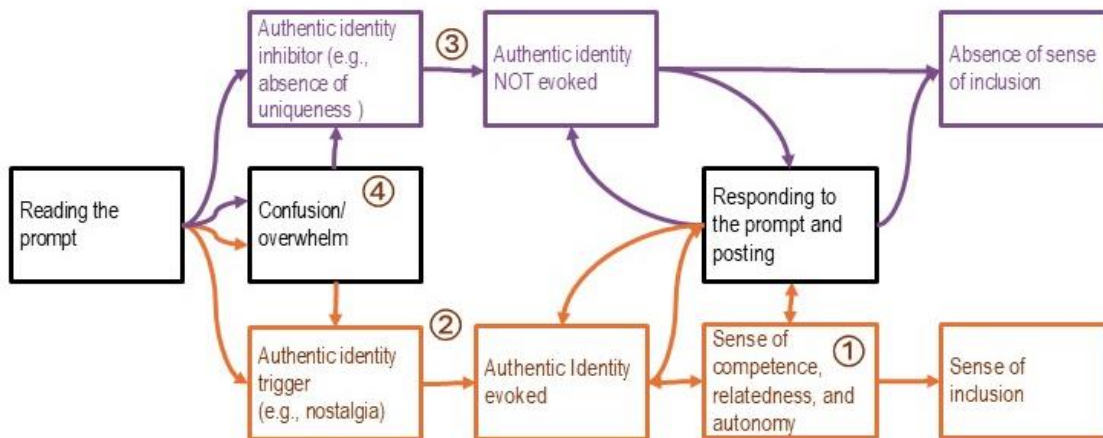
Uniqueness. Having something special to say

Nostalgia. Connecting warmly through past experience



Our conceptual model

This model illustrates the outcomes pathways that we observed among visitors in our study. While the orange pathway shows a sense of inclusion, the purple pathway shows absence of inclusion.



Emerging guidelines for designing inclusive response walls

1: Help people feel cared for and caring, competent, and empowered to make choices.

Why? Although it did not lead to feelings of inclusion on its own, a sense of relatedness, competence, and autonomy was important.

How? When we asked visitors about their experiences they pointed to specific design features.

Design for relatedness by inviting people to share their perspective and identity, allowing them to see other people's responses, and prompting them to think about or interact with people they love.

Design for competence by framing questions in terms of a person's own knowledge and experience (not "right" answers) and keeping the task of answering simple and intuitive.

Design for autonomy by allowing for choice wherever possible (e.g., in color of materials or location of response), welcoming personal expression like drawings and humor, and making space for people's "true" selves.

2: Ask questions that evoke and show respect for personal memories or experiences.

Why? Most people who felt competent, related, and autonomous also needed nostalgia (recalling and expressing their authentic self) to experience a sense of inclusion.

How? Visitors expressed nostalgia throughout the experience, but often as soon as they read the question. We recommend asking questions that invite people to think about something important to who they are.

3: Create an experience where everyone can feel special.

Why? Feeling not unique (like they had nothing special to say or contribute) pushed people away.

How? Seeing what others had to say was affirming for some visitors. While some visitors worried about giving a "boring" answer, closer looking by the visitor often revealed responses that resonated with their own ideas. We suggest showcasing many types of response through some intentional curation of visitor (and even staff) responses.

4: Consider ways to support people through confusion and overwhelm.

Why? Big questions can trigger big emotions, including anxiety about not knowing where to start. A state of confusion and overwhelm was okay for respondents under the right conditions, but it could be a negative experience for people who felt they had nothing special to say or for people from historically marginalized populations.

How? Visitors appreciated concrete examples and ample room to reflect without hurrying. Use what you know about your context to create emotional and physical space for people to process what else they have seen, what they are being asked, and how they might respond.

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