Institute for Learning Innovation

Supporting caregivers to facilitate hands-on activities with K-5 youth at home

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The GrowingGreat Veggies & Fruits National STEM Education Program is a collaborative effort between GrowingGreat, a garden- and nutrition-education nonprofit in Los Angeles, California, and eight science centers and zoos across the United States (Academy of Natural Sciences of Drexel University, Carnegie Science Center, Detroit Zoo, Discovery Center, Discovery Place Kids, Marbles Kids Museum, Oregon Museum of Science and Industry, Saint Louis Science Center), and funded by Del Monte Foods. The collaborative is an expansion of GrowingGreat's hands-on activity-based programming into informal science organizations to support these organizations' efforts to bring STEM-based garden and nutrition education programs to the communities that they serve. Year 1 of the project was interrupted by the COVID-19 pandemic and, as was experienced by science centers across the country, much of the in-person programming that was planned had to be shifted online to support at-home learning for families.

Led by Jennifer Jovanovic, Executive Director of GrowingGreat, several virtual meetings were held throughout the first year of the project to facilitate communication, program planning, and relationship-building between the education practitioners. Within this structure, as the pandemic unfolded in real-time, the collaborative offered a space for educators from different science centers to discuss the challenges they were facing at their organizations, including disruptions in programming, staff furloughs and layoffs, and the challenges they faced in supporting their local communities and partners. These opportunities for mutual support were highly appreciated by the educators who used the virtual meetings to discuss the constantly shifting pandemic and public education landscape, and to share ideas about how to effectively pivot to virtual programs and support families learning at home. In late 2020, when reviewing progress made during the first year of the project and planning the for the second year, the group acknowledged that their work would continue to take place during the ongoing COVID-19 pandemic which was driving virtual engagement and at-home learning while simultaneously putting extraordinary pressure on caregivers and families due to interruptions in their daily routines (e.g., school, work, childcare) while facing medical, emotional, and financial challenges. With this in mind, in Year 2 the group agreed to collect feedback directly from the caregivers with young children in their communities to better-understand how providers of science activities and virtual programs, such as informal science organizations, can better-support at-home learning for K-5 youth. This is important because family everyday activities are an important source of children's early science learning.

Our Approach

As the evaluation partner for the collaborative across both years of the project, the Institute for Learning Innovation worked with the project partners to develop and deploy a national survey to families with K-5 youth. The survey collected information from adult caregivers about their K-5 youth's experiences with hands-on activities at home, and how their participation may have changed while spending more time at home during the pandemic. Questions asked about their

participation in hands-on science activities, cooking activities, and activities planting seeds and growing food to eat (henceforth referred to in this article as "gardening" activities). Information was also collected about how the child participates (e.g., with whom), and caregivers' preferences (e.g., what features they look for when selecting activities). The goal of this initiative is to empower caregivers to identify the types of virtual resources that are most supportive of their youth participating in hands-on activities at home, and to advise the informal learning field on what they and their children need during this unparalleled moment. This information will be used by education practitioners in our collaborative, and perhaps by educators at other organizations, to design at-home activities that are more responsive to families' needs and preferences.

Who responded to our request for feedback?

GrowingGreat and six partner organizations distributed the survey to their audiences, including targeted outreach to communities of color. Caregivers were given the option to take the survey in either English or in Spanish. Distributed via the SurveyMonkey platform, the survey took less than seven minutes to complete, on average. Data were collected over seven weeks, starting in mid-February 2021. With a completion rate of 89%, 343 complete surveys were collected. Of the caregivers who finished the survey, 13% reported their ethnicity as Hispanic, Latino or Spanish origin; 77% reported their ethnicity not of Hispanic, Latino or Spanish origin, and 9% declined to answer. Sixty-five percent of the sample reported their race as white, 16% Black or African American, 6% Asian, 1% American Indian or Alaska Native, <1% Native Hawaiian or other Pacific Islander. Three percent of the sample indicated more than one race, and 16% declined to answer. Additionally, 58% of the sample reported no adult in their household had a college/university degree related to science and no adult in their household had at any time held a job or career related to science.

Survey respondents were highly interested in science and reported feeling confident in their ability to support their K-5 youth with hands-on at home science learning. Only 3 caregivers (<1%) selected *I am not interested in science* when asked about challenges that prevent them from assisting their K-5 youth. When asked to rate their confidence in their ability to help their K-5 youth with science homework or math homework (five-point scale, Strongly Disagree to Strongly Agree), 92% *Agreed* or *Strongly Agreed* that they felt confident in their ability to assist with science homework and 89% *Agreed* or *Strongly Agreed* they felt confident to assist with math homework. When asked to rate their confidence in their ability to assist their K-5 child with hands-on science, cooking, and gardening activities on the same five-point scale, caregivers also rated their confidence highly with most agreeing or strongly agreeing: cooking activities (96%), science activities (93%), and gardening activities (82%). Confidence assisting with cooking activities was rated significantly higher than science activities ($z = 2.088$, $p < .05$) and significantly higher than gardening activities ($z = 7.969$, $p < .00005$); confidence to help with science activities was also rated significantly higher than helping with gardening activities ($z = 6.523$, $p < .00005$). Overall, the sample of adult survey respondents were highly interested in science themselves and felt confident in their abilities to help their youth learn at home, which is more representative of the population of caregivers who visit science centers with their children than the general population of caregivers with K-5 youth in the United States.

Design considerations for informal science educators

Often informal science learning organizations create or recommend activities for families to try at home, with many intentionally increasing their support of at-home learning during the COVID-19 pandemic. Families have many options for how they spend their time at home, and activities that work at the science center may not translate well to a different setting. When designing new activities or dreaming up new virtual programs, particularly those that heavily rely on caregivers as facilitators or co-learners, it is important for informal science educators to take into account what caregivers might be looking for in a learning activity as well as the learning conditions present in the home environment.

Design considerations: What are caregivers looking for?

When asked what gets in the way of their family engaging in hands-on science activities at home, 48% of caregivers reported not having the materials or resources, 46% don't have the time, 21% need more support to run the activities, and 21% don't know where to find activities. Other barriers caregivers shared included: lack of time, particularly if caring for additional children in the household; and activities being too messy. Caregivers reported being interested in, and prioritizing, specific features when selecting activities (Figure 1). Eight out of ten caregivers polled stated they looked for *activities that require simple materials I already have at my house.* Seven out of ten were interested in *activities that we can do on our own time, and at our own pace.* Six out of ten were interested in *activities I'll enjoy too*, and five out of ten sought out *activities my child can do with minimal adult supervision.* When asked to describe any additional features they might look for in hands-on science activities, popular responses included: activities with materials provided in a kit, and activities that were easy to understand and do in a short amount of time. When asked what they had disliked about any hands-on activities they had tried the most common responses included: messy activities; activities that required too many supplies or supplies that were difficult to find; activities that were complicated, had poor instructions, or took too long; activities that required too much supervision or adult involvement; and activities that don't turn out as they're supposed to.

Design considerations: Who are K-5 youth participating with?

Another important factor for the designers of activities and programs to consider is how the activity will be used in a real-world context. For example, when designing for the home environment it is important to consider *who else* will be participating in the activity with the K-5 child, and how can the activity be structured flexibly to support the needs of different families. When asked to indicate who participates with their K-5 youth most often when they engage in hands-on science, cooking, or gardening activities, participating with *Primary Caregivers* was indicated most often across the three activity types (Figure 2). The second most frequently reported co-participant for the full sample of respondents was *other children who are younger than them*; K-5 youth were also reported to participate in hands-on science activities *alone* at a similar rate as they participated with younger youth (not true for cooking or gardening activities). When taking a closer look at how caregivers of different race/ethnicity backgrounds (white non-Hispanic, Black non-Hispanic, Hispanic) reported their youth were most likely to participate, some clear differences in participation preferences emerge.

As previously mentioned, *Primary Caregivers* were reported at the highest rates to be co-participants in hands-on home science, cooking, or gardening activities (for the full sample, and also among white non-Hispanic, Black non-Hispanic, and Hispanic caregivers specifically). Additionally, survey-takers who identified their race as white non-Hispanic were significantly more likely to report *Primary Caregivers* as co-participants than Black non-Hispanic and Hispanic survey takers across all three activity categories, with the exception of there being no significant difference between white and Black *Primary Caregivers* assisting with cooking activities[1]. *Other Adults* were significantly more likely to be reported by Black and Hispanic respondents as co-participants in cooking activities than by white respondents; and more likely reported by Hispanic respondents than by white or Black respondents as co-participants in gardening[2].

Other children were often cited as participating in hands-on science, cooking, and gardening activities at home with the K-5 youth. There was no significant difference by race in the frequency with which *Younger Children* were reported to participate in all three types of activities with K-5 youth. *Older Children* were reported as activity partners by Black and Hispanic survey-takers more often than white survey-takers; these results were statistically significant across all three activity types[3]. Hispanic K-5 youth were significantly more likely than white youth to participate in gardening with *Children of the Same Age*[4], and they were significantly more likely than white or Black youth to participate in gardening *Alone*[5]. Significant differences were also observed in the rates that survey-takers reported their K-5 youth did not participate in science activities or cooking activities, with Black and Hispanic respondents reporting this more often than white respondents[6]. However, despite the observed group differences, *Not Participating* was still the most infrequently selected answer choice.

Using cooking activities as an entry point to support at-home science learning

Survey feedback illustrated that involving young children in cooking activities at home is very popular. When asked to share how often their K-5 children participated in hands-on science, cooking, and gardening activities at home, caregivers reported youth participated in cooking activities significantly more often than science activities ($z = 9.821$, $p < .00005$) and gardening activities ($z = 14.172$, $p < .00005$), and science activities more often than gardening ($z = 9.585$, $p < .00005$). No significant differences were observed in the frequency of participation in cooking activities by race whereas differences were observed for both science and gardening activities with white caregivers reporting more frequent participation than Black caregivers for those two activities. It is also important to highlight that caregivers reported that they found it easier to help their youth with cooking activities at home than with science activities ($z = 4.854$, $p < .00005$) or gardening activities ($z = 5.763$, $p < .00005$). It is clear that cooking together as a family, and including young children, is an important activity in many homes that provides ample opportunity to experiment, develop science skills (e.g., measuring, observing), and explore food-related science concepts.

Although many families are already engaging in hands-on food-based activities together, it is less clear how many are associating their activities with *doing science* or *learning about science*. This is a clear opportunity for informal science educators: science-based food preparation activities are an excellent avenue to support at-home family science learning. When asked if their

family would be interested in hands-on science activity ideas related to preparing or cooking food, ninety-six percent of caregivers in our sample responded *yes*. Additionally, as preparing food together may already be a frequent household activity, this approach may also be successful with families who are less likely to be interested in at-home activities related to other science topics. As always, when designing new activities, practitioners should remember some of the design preferences reported by caregivers in this study: for example, most caregivers preferred activities that didn't take too much time, were not messy, used simple or easy-to-find materials and resources, required minimal adult supervision, and could involve children of multiple ages.

With this investigation, our goal was to determine what sorts of virtual resources provided by informal education institutions were identified by caregivers as useful and of interest to support their K-5 youth in participating in hands-on science and nutrition education activities at home. This survey was framed as a way to empower caregivers to advise the informal learning field on what they and their children need to engage in more hands-on science, cooking, and gardening-related activities at home. The educators working with the GrowingGreat Veggies & Fruits National STEM Education program will incorporate these ideas into their future program development, and we invite you to as well! For suggestions of food-based activities to share with the families you work with, see these free resources from GrowingGreat.

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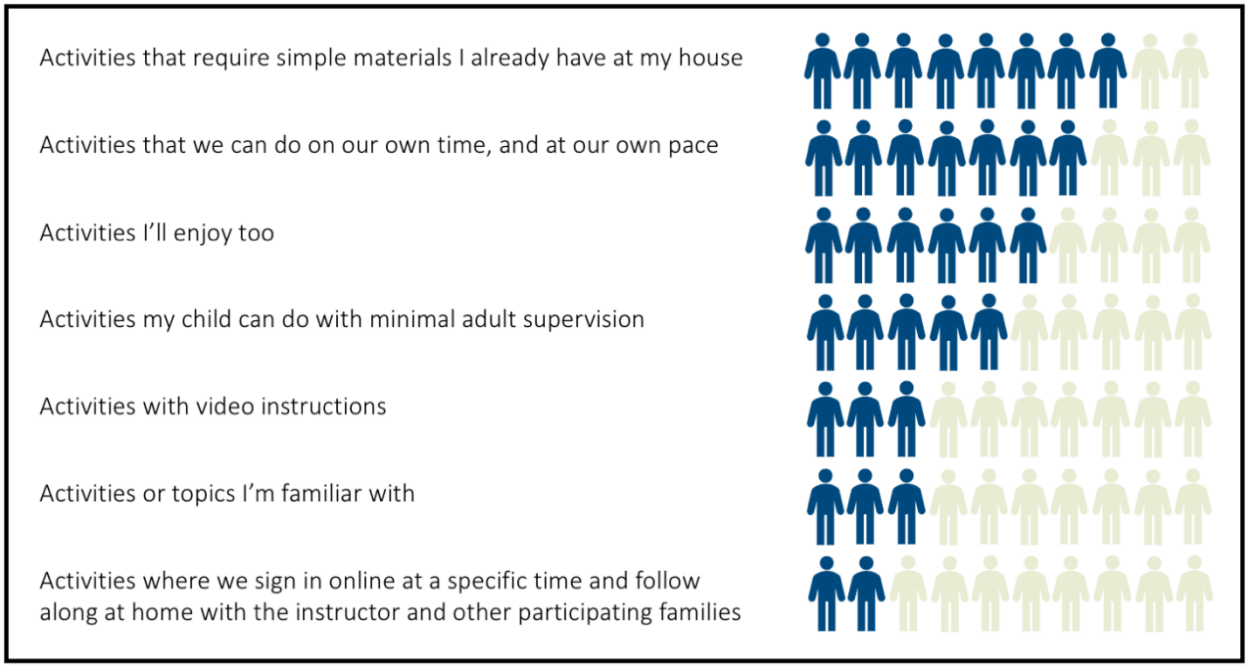
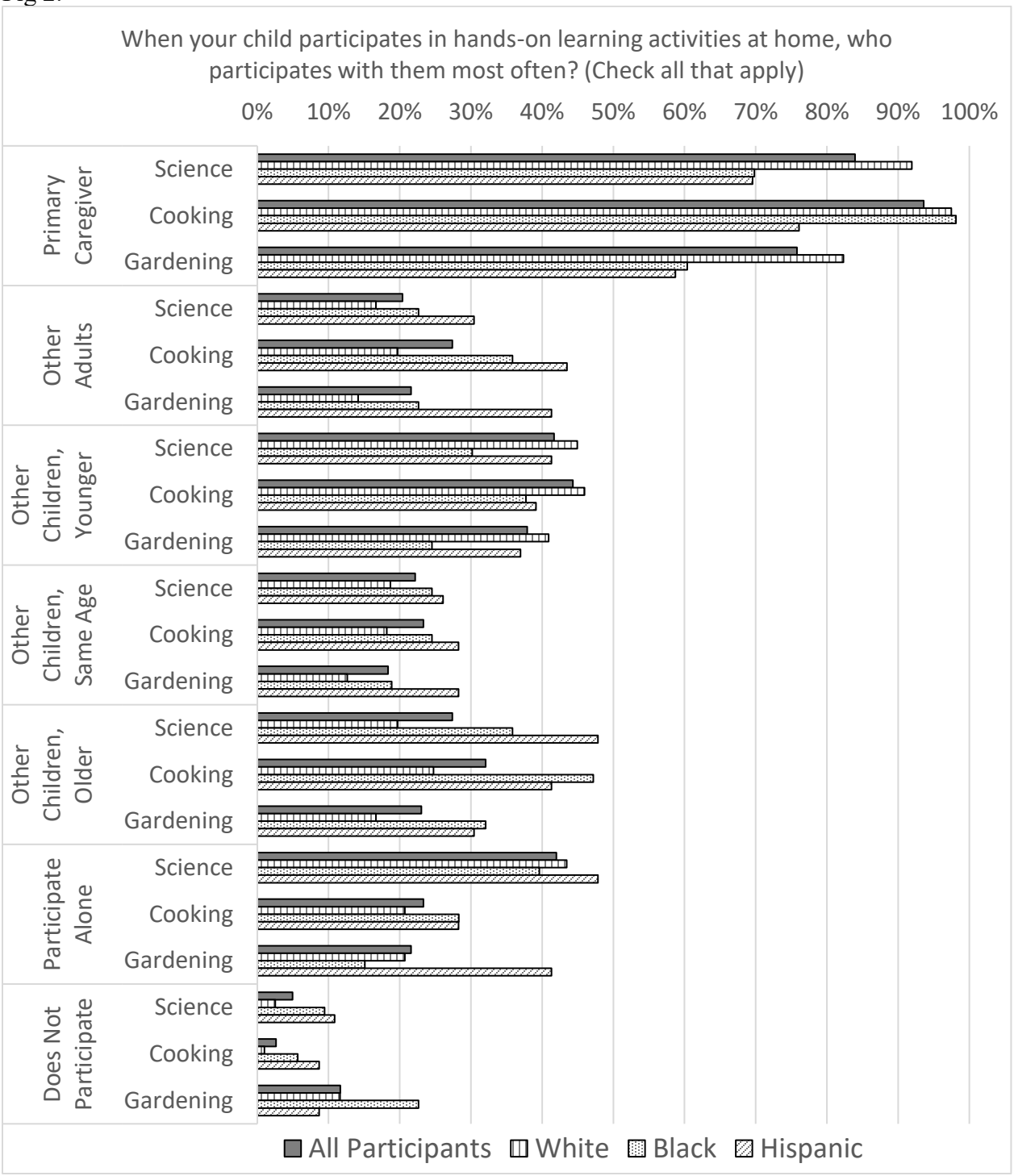
Fig 1.



Number of surveyed caregivers (out of 10) that responded affirmatively to each option for the question: *When searching for new hands-on science activities, what do you look for? (Check all that apply)*

Fig 2.



Percentage of surveyed caregivers that responded affirmatively to each option for the question: *When your child participates in hands-on learning activities at home, who participates with them most often? (Check all that apply)*. The chart illustrates percentage of all survey respondents (n=343), the percentage of non-Hispanic white respondents (n=198), the percentage of non-Hispanic Black respondents (n=53), and the percentage of Hispanic respondents (n=46) for each question option.

[1] Primary Caregivers, Science Activities: white and Black respondents, χ^2 (1) = 18.37, p < .0005. white and Hispanic respondents, χ^2 (1) = 17.30, p < .0005. Primary Caregivers, Cooking Activities: white and Hispanic respondents, χ^2 (1) = 27.87, p < .0005. Black and Hispanic respondents, χ^2 (1) = 15.50, p < .0005. Primary Caregivers, Gardening Activities: white and Black respondents, χ^2 (1) = 11.62, p < .005. white and Hispanic respondents, χ^2 (1) = 12.09, p < .005.

[2] Other Adults, Cooking Activities: white and Black respondents, χ^2 (1) = 6.14, p < .05. white and Hispanic respondents, χ^2 (1) = 11.51, p < .005. Other Adults, Gardening Activities: white and Hispanic respondents, χ^2 (1) = 17.71, p < .0005. Black and Hispanic respondents, χ^2 (1) = 3.99, p < .05.

[3] Older Children, Science Activities: white and Black respondents, χ^2 (1) = 6.14, p < .05. white and Hispanic respondents, χ^2 (1) = 15.75, p < .0005. Older Children, Cooking Activities: white and Black respondents, χ^2 (1) = 10.11, p < .005. white and Hispanic respondents, χ^2 (1) = 5.09, p < .05. Older Children, Gardening Activities: white and Black respondents, χ^2 (1) = 6.22, p < .05. white and Hispanic respondents, χ^2 (1) = 4.55, p < .05.

[4] Same Age Children, Gardening Activities: white and Hispanic respondents, χ^2 (1) = 6.94, p < .01.

[5] Alone, Gardening Activities: white and Hispanic respondents, χ^2 (1) = 8.54, p < .01. Black and Hispanic respondents, χ^2 (1) = 8.53, p < .01.

[6] Does Not Participate, Science Activities: white and Black respondents, χ^2 (1) = 4.22, p < .05. white and Hispanic respondents, χ^2 (1) = 6.61, p < .05. Does Not Participate, Cooking Activities: white and Black respondents, χ^2 (1) = 4.63, p < .05. white and Hispanic respondents, χ^2 (1) = 9.19, p < .05.