

Ruff Family Science
Needs Assessment Summary Report
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Prepared by Education Development Center, Inc. (EDC)

Overview

Ruff Family Science is a project funded by the National Science Foundation (NSF) that aims to foster joint media engagement and hands-on science exploration among diverse, low-income parents and their 4- to 8-year-old children. Building on the success of the PBS series *FETCH! with Ruff Ruffman*, the project leverages *FETCH!*'s funny and charismatic animated host, along with its proven approach to teaching science, to inspire educationally disadvantaged families to explore science together. More specifically, the project is undertaking a research and design process to create prototype resources (digital media, hands-on activities, and supports for educators) that meet the needs of **families with a parent enrolled in an adult education program**, addressing parents as both adult learners *and* as caregivers who can nurture their children's development in science. In doing so, the project's ultimate aim is to build new knowledge about the potential for digital media to inspire and support **intergenerational science learning among vulnerable families**.

WGBH (a leading producer of educational STEM media) and Education Development Center, Inc. (EDC, experts in how technology can influence and enhance teaching and learning), are collaborating on the project through three phases: a Needs Assessment Phase, Prototype Development Phase, and Prototype Testing Phase. **This report summarizes the findings from the Needs Assessment**, which was undertaken to determine key motivations and behaviors common to adult education students who are also parents; surface obstacles and assets inherent in these parents' current practices for joint engagement with their children around science learning; and examine the needs and available resources for supplementing parents' current engagement in family science learning, as well as the needs and available resources for supporting the instructional practices of adult and family educators.

Sample

EDC's research team collected data for this needs assessment in a number of ways, as described below.

National Center for Families Learning Educator Interviews

The research team attended the National Center for Families Learning (NCFL) 2017 annual conference for the purpose of interviewing program educators ($n = 9$) engaged in implementing family or adult education programs. Interview participants came from NCFL-affiliated nonprofit community service organizations across the United States. Almost all of the NCFL interviewees currently are, or at one point were, teachers of adult learning classes. Those who used to teach courses typically have moved into administrative or supervisory positions, in which they focus on program planning and course rollout but no longer directly facilitate instruction. Those who currently teach reported that their courses focus on English as a Second Language (ESL), literacy, and parenting skills. Although some interviewees are new to their role (one year or less), most have been with the organization for several years. One was a 26-year veteran of her organization.

Partner Program Site Visits

The research team conducted four visits to adult or family education partner program sites in Alabama, Kentucky, and Nevada. These sites were selected by Alabama Public Television (APTV), Kentucky Educational Television (KET), and NCFL—the primary partners of this project—in consultation with WGBH. EDC visited two NCFL partner program sites in Nevada because of the organization’s work with a diverse set of adult learners in various locations throughout their organization’s service area. Throughout this report, we call APTV, KET, and NCFL “primary partners” and any programs they selected for project participation “partner program sites.”

Below is a brief description of each partner program site’s project-related program activities:

- The **Alabama** partner site is a literacy organization that works with parents and teachers with children from pre-K through eighth grade in afterschool programs. The site offers parents and child-care educators across the state a variety of trainings, coursework, and on-demand online resources focused on early childhood. For educators, these offerings include in-person trainings and leadership courses, which are supplemented by free online resources. For parents, offerings include English for Speakers of Other Languages (ESOL) classes and family literacy workshops in both English and Spanish.
- The **Kentucky** partner site is a county adult education program that offers adult high school equivalency exam preparation courses in science, social studies, language arts, and math. Students also have access to career and college readiness/transition courses, citizenship programs, parenting classes, ESL programs, and life skills classes.
- The **Nevada** partner site is an NCFL-affiliated Family Learning Program that engages parents and families via parent learning workshops, Family Service Learning projects, and Parent and Child Together (PACT) time, during which parents and children spend time together, with direct coaching from facilitators.

During the site visits, EDC conducted **interviews** with staff from these partner program sites, as well as with staff from APTV, KET, and NCFL (primary partners). Altogether, 23 program directors, station staff members, educators, and other program staff members participated in interviews as part of site visits to partner locations in Alabama, Kentucky, and Nevada. Roles of program staff included the following:

- Adult education specialist
- Director of adult education and work force training
- Education special projects manager
- Early childhood education coordinator
- Early childhood education director
- Vice president for educational services
- Site coordinator
- Parent site coordinator
- Curriculum writer and researcher
- Outreach coordinator

EDC also conducted four **focus groups** (two in Nevada, one in Kentucky, one in Alabama) with adult learners from partner program sites (25 adult learner participants in total with focus group sizes ranging from 4 to 8 participants). Participants were selected based on self-reporting that they have at least one child between the ages of 4 and 8.

Caregiver Survey

Surveys were collected from 79 adults who were identified to care for at least one child between the ages of 4 and 8. These adults are enrolled in adult and family education partner program sites in

Alabama, Kentucky, and Colorado. These partner program sites were selected by primary project partners but do not overlap with any sites that participated in the focus groups. Participant numbers by locale are provided in Table 1.

Table 1. Caregiver survey responses by location (N = 79)

Location	Surveys completed by adult learners
Alabama	30
Colorado	24
Kentucky	25

Ninety-one percent (91%) of respondents ($n = 72$) were female. A little over half (52%) of participants identified as white (Non-Hispanic). Thirty-seven percent (37%) of participants self-identified as Hispanic or Latino, and 5% self-identified as black or African American. Smaller percentages identified as Asian (1%), Other (3%), and preferred not to answer (1%).

Fifty-eight percent (58%) of participants reported speaking English at home, and 22% reported speaking Spanish at home. Only 3% of participants reported speaking another language at home; languages included Arabic and Farsi. Fifteen percent (15%) of participants reported more than one language being spoken at home. Two participants did not provide data for this question.

Twenty-three percent (23%) of participants reported having one child, and 24% reported having two children. Thirty percent (30%) of participants reported having three children. Twenty-two percent (22%) reported having four or more children. One participant did not answer this question.

Participants were asked about their relationship to the child ages 4 to 8 that they are thinking about when responding to questions in this survey. Seventy-six percent (76%) reported being the child’s mother, and 8% reported being the child’s grandparent. Five percent (5%) reported being the child’s father. Ten percent (10%) of participants reported that they had a different relationship to a child (i.e., aunt and nanny). Others reported “mother and father,” so it is unclear whether they are the child’s parent or if they are related in some way to the child’s mother or father.

Results

EDC combined the data from all sources (NCFL educator interviews, partner program site visits, and parent surveys) to learn more about the following aspects of adult and family education programs: (1) partner program characteristics, (2) program constraints and supports, (3) constraints and supports for learner engagement, (4) adult learner attitudes and motivations, and (5) existing assets for teaching science. The following sections present findings from each of these areas respectively.

1. Partner Program Characteristics

This section addresses the following research question: *What are the common characteristics of adult and family education programs and the adult learners they serve?* Below, we describe findings related to partner program characteristics including their goals for community work, logistics of program offerings, populations served, and participant perceptions of coursework.

Partners' Goals for Community Work/Participants' Goals

When asked about their programs' goals, program directors from our partners and their affiliated partner program sites consistently emphasized the **importance of building adult learner skills** that extend beyond the life of the class or program they currently attend. Programs want to provide opportunities for adult learners to be better parents, to develop new careers and/or develop professional skills that cultivate opportunities to work, or to simply have new life skills.

Another clear theme was the **importance of family learning**. This was particularly evident among NCFL programs. One NCFL program director said that their overarching goal is to “eradicate poverty through family-based education solutions and what we mean by that is building adult capacity and child capacity simultaneously.” This was reiterated by NCFL’s program directors and educators across the country. Several NCFL program staff members said that they want parents to better understand how to engage in educationally rich activities with their children. Another program director said, “we really try to help them understand the intentionality of what you’re doing in parent time, really being a laboratory, so to speak, of what you’re going to do and actually do with your child during the activity.” One program director from Nevada said they want parents to learn to be their child’s first teacher, that they want to “teach them, integrate them, and help them help their kids.” Other primary partner and partner program site staff discussed the desire to increase parent knowledge about how to navigate school systems so they can be a support for their children.

Program goals clearly align with the individual learning goals reported by adult learners, particularly around building new lifelong skills. Adult learners who participated in our project’s caregiver survey ($N = 79$) were asked what they wanted to learn from their respective program. Most responses for this question fit into three major categories: **(1) Helping their child learn, (2) English language learning, or (3) Academic achievement**. Thirty-six respondents (46%) reported that helping their child learn was their goal for participating in their program. These participants saw the program as an opportunity to learn how to help their child get prepared for school. For example, one participant reported, “Learn to write, use scissors + crayons, get ready for kindergarten.” Twenty-two participants (28%) reported that they wanted to strengthen their ability to communicate in English. These came in two forms: to be able to communicate with their kids or to be able to communicate in English for work reasons. One participant reported, “To be able to communicate better in English to be able to communicate with the teachers and help my kids with their homework.” Twelve participants (15%) reported that they hoped to learn academic skills. Nine of these participants reported specifically wanting to learn everything necessary to attain a high school equivalency credential. Three reported more specific skills like, “math skills,” “science,” and “language arts.”

When asked why they enrolled in their current class, adult learners in focus groups reported additional insight related to individualized learning goals. Several Spanish-speaking participants said they started **taking classes to learn English so they can communicate with staff at their children’s schools and understand homework and paperwork that their kids bring home**. Several native English speakers in focus groups said they want to further their education by coming for high school equivalency test prep and that these classes are **helping them reach their educational goals**. Participants also reported that, through program enrollment, they are better able to help their children with homework.

How Partners Work with Partner Program Sites to Reach Families and Deliver Services

In large part, our primary partners (NCFL, KET, and APTV) are indirect service providers that rely on other education programs in local communities (i.e., partner program sites) for service delivery. Many staff or program directors from primary partners report that they **work with direct service providers like schools, adult learning facilities, literacy guilds, home visiting programs, or other community organizations to provide families with the resources and training that they may need**. As such, interviewees said that the development of meaningful connections is crucial in their work. Three examples of this indirect service model are included below:

- In Kentucky, KET program staff works through adult education centers across the state and has cultivated relationships with most of its regional partner program directors. Program staff members work with NCFL and United Way to offer professional development to teachers around resources and have trained 7,000 teachers in seven years. Program staff also mentioned KET's involvement in the development of the *FastForward* curriculum that is used to support the college and career readiness skills of adult learners.
- NCFL program staff at the national level reported that its organization does not always work directly with parents. Rather, it receives requests from schools with significant parent education needs to provide programming centered on family literacy or family learning through community service (NCFL's initiatives include four components: children's education, which is generally considered in-school time; adult education; parent education; and PACT time). To support these components, NCFL provides a set of lesson plans that guides adult skill building in literacy, English, and career skills to help parents reach their educational goals. At the local level, educators were a bit more descriptive of direct service programs. NCFL program educators provide programming for parent time, technical training and educational materials for PACT time, and access to supportive digital communities (e.g., Wonderopolis, Family Trials, and the Learn to Earn Toolkit, and the National Literacy Directory).
- APTV provides needs-based community awareness; different agencies will approach it for parent education workshops based on perceived needs of their participants. The station often partners with local programs to engage in trainings for staff and professional development for parents and teachers. It also works with partner programs to offer seven-week professional leadership courses, support ESOL classes, and deliver family literacy workshops in Spanish. Most often, it connects directly with parents and teachers with children from pre-K through eighth grade through afterschool programs.

Logistics of Program Offerings

Often, courses of partner program sites (sites affiliated with our primary partners NCFL, KET, and APTV) take place in locations like schools and community centers, but some participants mentioned field trips to museums, art institutes, or natural settings. Courses are typically facilitated by staff internal to the partner program site, but outside educators or speakers are not uncommon.

Findings related to **course offerings** suggest that among adult education programs at partner program sites, ESL and high school equivalency exam preparation courses are most common. Among family education programs, course offerings emphasize how parents can support children's academic success and cover parenting strategies like building self-esteem, instilling confidence, using appropriate disciplinary strategies, and resolving conflict. Courses for parents also aim to familiarize learners with

the inner workings of the school, health, housing, and financial systems. Instruction to develop basic computer skills is also a common feature of parent courses, likely as a means to help parents support their children's academic success as well as their own job readiness.

The reported **frequency and duration of courses varies** and was often unclear because of the simultaneous involvement of multiple cohorts. Responses were ambiguous as to whether courses that met "4 days per week" involved the same adult learners each day, or multiple groups of adult learners who met once or twice per week. Responses suggest that family learning classes typically meet about once per week, whereas ESL or high school equivalency exam prep classes may meet more frequently.

Only NCFL partner program staff described programming that regularly emphasizes the importance of bringing parents and children together as a foundation of their work with adult learners. The frequency and duration of the NCFL program's PACT time varies across organizations and programs; in some cases, PACT time is offered multiple times per week and in others it is offered a handful of times per year. At times PACT time was referenced as a component of child-focused educational programs, in which parents are invited to visit classes to observe a culminating event, participate in a special project, or attend a special Family Night. An oft-cited goal of PACT time is to give parents opportunities to apply strategies they learn about in their own courses, such as strategies related to supporting academic success. Most importantly, though, **PACT time is about supporting family time, family learning, and family communication**. Interviews with program staff suggest that PACT time is shorter than the typical duration of parent-only courses, lasting between 30 and 60 minutes.

Populations Served

As expected, EDC found that the primary partners (APTV, KET, and NCFL) and their affiliated adult/family education program sites primarily serve low-income, high-poverty communities with diverse racial/ethnic backgrounds.

Below is a summary of participant characteristics across and within partner program sites:

- **Race/Ethnicity.** Participants come from a diverse range of racial and ethnic backgrounds. Hispanic/Latino, African American, Caucasian, and Native American from tribal communities were some of the most commonly mentioned populations that make up a significant portion of program participants.
- **Country of Origin.** Many partner program sites serve a large number of immigrant or refugee families. Programs serve adults from countries worldwide, in one case reportedly serving students from about 40 different countries. Many learners hail from Mexico, Guatemala, or other areas of Central America. Multiple interviewees also reported that students commonly are from Afghanistan, Sudan, Somalia, Ethiopia, Eritrea, Iraq, Syria, Myanmar, Haiti, and the Democratic Republic of Congo. Some of these families harbor concerns about their undocumented status.
- **Language.** Many adults served by our primary partners and their affiliates are English language learners and have difficulty finding work because of their limited English proficiency. According to one program director, "I have parents that are lawyers in their countries, doctors, engineers and they just don't know the language and they can't start studying again." Interviewees did not comment on the English proficiency levels of children who are involved in family literacy or education programs; however, interviewees said occasional communication challenges emerge when children are resistant to speaking their native language (i.e., when they speak English far better than their parents or caregivers and struggle with communicating with adults in their native

language). Spanish is the most common language spoken by participants other than native English language speakers.

- **Socioeconomic Status.** Most programs serve families in very low-income communities in rural and urban settings.
- **Age.** Overall, the programs serve a wide age range, with adults ranging from 18 years to senior citizens. Their children range from newborn to adult. Educators who work with a particular school, however, said that adults they work with need to have a child who attends that school, so the age range in those cases is restricted to the ages that the school serves (e.g., K–5).
- **Parental Status.** The majority of primary partners and partner program sites serve a high percentage of adult students who are also parents or caregivers (e.g., grandparents, other relations). This is particularly true of organizations affiliated with NCFL, because NCFL’s programming offers a range of courses designed for parents only, along with designated time in which parents and children come together (PACT time).
- **Gender.** Most sites serve more women than men, with many single mothers.
- **Education Level.** Adult learners’ education and literacy levels vary but are heavily skewed toward low; many have had little formal schooling, and some cannot read or write in their native language. One said, “A lot of people think that GED is where it starts but there are people who can’t take advantage of work or workforce development . . . because their literacy skills are so low.” Several interviewees said many of the adults struggled in school, had learning disabilities, dyslexia, ADHD, or “had life situations or circumstances that made a traditional route of pursuing an education difficult.” Adults enrolled in ESL classes are more likely to represent a range of education levels; various interviewees referred to adult participants who were professionals in their home country or who are attending college.
- **Required vs. Voluntary Participation.** Most participants attend programs voluntarily, but some are required to do so, because of a court order, as part of a custody agreement, to qualify for Medicaid, or to fulfill requirements from a Food Stamp Office.
- **Goals.** Adults participants are driven by a variety of goals. Most commonly, interviewees referenced goals relating to gaining/keeping employment or finding better employment (particularly among adult students pursuing a high school diploma), helping their child with school work, building self-sufficiency, and developing better parenting practices. A few educators relayed that adults’ goals often evolve over time, so they might come at first to learn how to be a better parent, but then start thinking more broadly about developing other skills for employment.

Participant Perceptions of Courses

Researchers asked focus group participants to describe what their classes are typically like; learners discussed working on academic and parenting skills **through written activities, games, conversations, and involvement in projects or events**. The Alabama focus group (composed of ESL students) said they have to speak English in their classes, which can be challenging for them. They have a book that they use in class, follow the sections and chapters, and work on the assignments in the book. Then they have a conversation to practice what they learned and play games to make learning English words more fun. The Kentucky focus group (composed of GED students who were also enrolled in ESL classes) said that they learn English through the different subjects being taught, their surroundings, or their own lives. Participants said they are learning things that can help their kids and that the staff is motivating and positive. The Nevada focus groups (composed of participants in family learning programs) said that the class has a family atmosphere. Everyone comes to learn how to be a better parent, and to share ideas and best practices from their homes. Participants do hands-on activities during their time together; they

also might do surveys, visit websites, or look at different learning resources on tablets. They work together to plan major projects and community events. They have parenting homework in which they practice good parenting techniques and then talk about the effectiveness of the techniques when they meet again in class.

Across partner program sites, focus group participants were enthusiastic about **connecting their adult learning experiences to their interactions with children at home**. When asked if they ever do activities at home with their children that they learned in class, adult learners in Alabama said that they basically get the same homework as their children, so they can work on it together. Researchers interpreted this as that their homework often covers the same English language and literacy concepts as those in their children's work. The Kentucky group participants said they try to practice the English language skills learned in class with their children at home. They also use their exam preparation coursework to help their children with their homework. As previously mentioned, the Nevada groups get parenting homework each week, so they practice techniques at home. A typical assignment might be to ask their children about what they are learning in school and document the conversations; they then talk about their success or areas for improvement in a large group at the next class. Nevada focus group participants also get their children involved in their community service and volunteer effort.

Adult learners in focus groups provided insight as to **what keeps them engaged in adult or family learning programs**. Participants said that they keep coming back to classes to further their education and improve their English skills, for the community among staff and parents, and for the invaluable information about their children's school. Parents said the best parts of being a parent and a student at the same time are being able to speak the same language as their children and seeing how their children are learning. They like coming to class and learning, and being empowered to improve their lives.

2. Program Constraints and Supports

This section addresses the following research questions: *What constraints and supports do adult education programs face in integrating science learning into their programming, and in recruiting parents to participate in their classes?*

Below we present the most commonly discussed program constraints and follow with any supports discussed by primary partners and their affiliated adult and family education partner program sites.

Constraint: Programs face challenges in getting and keeping families involved.

As expected, staff from primary partners (NCFL, KET, and APTV), along with program directors from our partner program sites, discussed the **difficult but important task of cultivating and maintaining participant engagement** in the adult and family education programs they offer. As described in the section above (see Populations Served), programs serve a wide variety of adult learners with individual differences in life circumstances, participation goals, interests, and motivation levels. Discussions about these participant groups suggest that program directors and staff take concrete measures to support learners' own motivation levels and ensure continued participation and learner engagement.

Support: Programs use a variety of creative recruitment/engagement strategies.

Program staff make use of a range of recruitment strategies to support consistent engagement from adult learners. **In-person outreach seems to be the most common and the most effective**, but other approaches are described below and include using texts, social media, direct mail, and signage/fliers.

Program directors talk to parents directly and pass out fliers outside of schools during drop-offs and pickups. One director said, “what works the best is us being out there talking to parents.” Schools help outreach efforts by sending parents links via email or sending letters home. Another useful tool is to call or text parents who register for classes to remind them and encourage them to continue coming (e.g., call the day before and say “see you tomorrow!”). Directors use social media such as Facebook, put up signs around schools and centers, and attend community partners meetings where parents are involved. Directors also said that word of mouth is one of their most effective recruitment tools.

Station staff members use social media—including Facebook, Instagram, and Twitter—to promote attendance at events. Organization websites also feature upcoming activities and events. Event and training calendars are placed in visible spaces at public media stations. Staff members distribute flyers, handouts, and postcards, perform direct outreach at schools, and attend and present at conferences.

Constraint: Currently, most programs do not explicitly emphasize science learning as a priority topic.

Organizations vary as to the kinds of science programming they offer to adult students and their families. Staff from several partner program sites said that they had no experience offering science activities or courses, instead favoring programming that builds math or literacy skills. However, many family and adult education programs offer some type of occasional science programming for their participants.

Family education programs reported that they sometimes offer discrete science-oriented events or experiments during family learning time. Examples cited by interviewees include making slime, building a volcano, building robots, building a roller coaster, making a small car, exploring chemical reactions (e.g., mixing Mentos and soda), baking, and studying or discussing living things (e.g., plants, insects, butterflies, mammals). Families most often participate together, with parents engaging in science along with their children. Sometimes staff members at partner program sites run these science activities, but they are most often facilitated by outside agencies or guest experts. Partner program site staff said that they typically need to make sure that materials are free or low-cost and readily available.

Education programs geared toward adult learners reported that they offer science programming mostly in the context of high school equivalency preparation courses. One interviewee noted, “You don’t hear a lot about science, but it is a component.” Educators of these classes had the most science-related training and expertise, and some organizations reported that they also partner with experts (and/or organizations like science museums) to enhance or support program implementation. Adult educators said that they must often teach to the test, and feel that doing so limits the science experiences of their learners. These educators for the most part did not report current efforts to promote science among their adult students’ families, with children’s exposure to science typically limited to the resources made available for parents to take home.

Support: Most partner program sites have some science programming/resources that can be built on, and adults and families enjoy the science programming that is currently offered.

Though science is not a specific programmatic focus for many programs, **several high-quality resources exist to support the periodic infusion of science learning into existing programs.** Among NCFL programs, the most commonly referenced approach for engaging families with science in an ongoing way was through Wonderopolis, a STEM-focused digital community that NCFL offers to help facilitate family learning programs. A prominent feature of Wonderopolis is the Wonder of the Day, which is a daily feature intended to spark curiosity and discussion within families and classrooms. In addition to a read-aloud feature for people with low literacy skills, there are embedded videos and audio content designed to make inquiry interesting to children and families. Spinoff experiences include Camp Wonderopolis, a six-week, 42-lesson, inquiry-based digital summer camp referenced by multiple directors. (For additional information on these referenced resources, see Appendix A.)

Although science has not been a priority area of emphasis in the past, multiple NCFL program directors referenced ongoing efforts to **gradually infuse the principles of science and scientific thinking** into their general programming through a two-generation lens. Parent engagement efforts that happen within NCFL's Family Service Learning program, for example, involve parents using the scientific process without naming it as such; when the parents decide on their community service project, they have to go through the scientific method and investigate their surroundings and community needs, prepare and plan, carry out their project, review and evaluate, and identify how they would change their approach next time.

APTV and KET also reported increased interest in STEM among the audiences they work with regularly. One station staff member mentioned a big push for STEM in Alabama, particularly among the infant/toddler age range, and reported that **STEM-related trainings have the biggest turnout among educators and are the most requested type of training.** STEM has also gotten a lot of attention in Kentucky, where early childhood and kindergarten readiness is a huge issue. To combat misconceptions around science, station staff has created a collection of Everyday Learning Resources: hands-on activities, videos, and interactive games for children in preschool through first grade. Other station staff referenced parent-only activities in which parents do an activity that they can later do at home with their children. Staff provides materials or printouts so that learners have what they need to do that activity at home, and staff stressed the value of providing parents with opportunities to become familiar with science activities and to practice them before doing them with their child.

Positive reactions from parents and children confirm for partner program site staff that science activities currently offered by programs hold great appeal. Program site staff said parents are always excited and enthusiastic during and after science activities, and children frequently ask for more of them. Programs also reported that science activities are successful in involving children of varying ages (e.g., one program had children in grades 3 through 8 building roller coasters).

Constraint: Educators have limited experience teaching science, and many lack resources and support.

Partner program site directors reported that many adult and family educators have **limited experience in teaching science.** One NCFL director explained that this is primarily because their programs typically recruit English or math teachers, rather than science teachers, for instructional roles. Most of the adult and family educators interviewed **confirmed that they had little or no previous experience teaching science themselves.** Instead, they often rely on visiting experts or seek secondary support during science activities. Those who do facilitate science activities typically lack formal training to do so. They prepare for activities by educating themselves and seeking free resources and information.

Program staff also reported that their educators commonly lack resources and support that would help them to effectively integrate science into their programming. Interviewees alluded to outdated curricula, small budgets for materials, lack of staff with expertise (particularly staff members who speak the language of their adult learners), limited background information to prepare existing staff, and lack of knowledge about which topics, skills, or approaches are best for their audiences and age groups. They also thought it would be important for educators to have instructional support on how to let children take the lead, and on how to encourage families to explore and discover together.

When discussing science in existing curriculum materials, one NCFL director reported an over-emphasis on “the nuts and bolts” of achieving particular goals like preparing for an exam or developing a résumé. What gets lost is “the larger picture” of what kinds of skills and knowledge will help a person more generally. The director said, “I think some of the 21st century skills around creative thinking and problem solving fit very naturally within a science environment. I think those are topics that can be taught through science in a very hands-on relevant way which we know is good in education if adults and children can learn through relevant hands-on kinds of approaches.”

Primary partner staff further emphasized that educators may need clarity on doing science activities that focus on exploration rather than “an end product.” As one interviewee said, “It almost comes across that they’re a little bit scared to have something that’s not like an instruction that’s readymade and anything like a science experiment to them sounds like a big deal.” They said that many educators associated with their programming think science is something that starts in second and third grade, and would need support for promoting exploration and the kinds of knowledge and skills we aim to promote. Interviewees explained that educators and parents often think about science in terms of high-level concepts and highly skilled jobs, whereas reframing it about awe and wonder can make it less intimidating.

Support: Despite limited experience, most educators would be comfortable teaching science, particularly if reframed to be less intimidating to parents and if given more training and resources.

Because many adult and family educators lack experience and resources, some staff members at primary partners anticipated anxiety and resistance to teaching science. Other staff members, however, anticipated that their educators would be confident and successful at teaching science, as they have been when it comes to teaching other domains (e.g., financial literacy, health literacy), as long as they are given appropriate materials and background information.

When asked directly about their comfort level teaching science, educators themselves expressed confidence and enthusiasm overall. Most said that they would feel comfortable teaching science if asked to do it more often, particularly if they had access to the relevant content, materials, and preparation/training. Several said they wished their organization offered more science activities, and they voiced the importance of science for academic success and in everyday life. One educator referred to science as a “gateway for engaging a parent and child together for the . . . academic success for their child,” underscoring its alignment with their organizational goals for children and families. Interviewees also stressed the value of science for promoting language development, in that science provides “so much to talk about” and for parents it is “a really great way to connect with their children.”

Directors expressed similar opinions that having “**a specific curriculum**” would help educators who are not trained to teach science feel prepared and competent. Interviewees across groups agreed that more

support, training, and resources are needed to prepare both educators to teach science and to prepare parents to be ready to learn.

3. Constraints and Supports for Learner Engagement

This section addresses the following research question: *What constraints do experts identify as preventing families in their adult education programs from engaging in and persisting with intergenerational science activities, and what supports might help them overcome those constraints? Do adults/parents in partner programs identify similar constraints and supports?*

As we did in the previous section, we present the most commonly discussed constraints for adult learner/family engagement in science programs, as well as any supports mentioned by program staff or program participants.

Constraint: Families face a variety of barriers to participation in educational programming.

There are a range of challenges that impede adult learners and families from fully participating in adult and family programming. Many obstacles and accommodations identified in the NCFL interviews were echoed in partner program site visits and primary partner interviews with program directors, station staff, and educators. Table 2 summarizes the obstacles most often relayed and the supports that organizations create to address them.

Table 2. Adult learner engagement constraints and supports

Constraint	Description	Supports Reported
Scheduling/ time management	Adult learners have jobs with irregular schedules, unconventional hours, or often work overtime. Keeping up with children, housework, and homework is often a challenge.	<ul style="list-style-type: none"> • Offer courses at different times of day, with morning, evening, and weekend options • Offer one-on-one support (like tutoring) to meet a learner’s unique needs • Go above and beyond, such as by working directly with employers to carve out instructional time
Transportation	Some adult learners lack access to a car, can only get to facilities accessible via public transportation, or do not have easy access to public transportation.	<ul style="list-style-type: none"> • Situate courses/facilities close to public transportation or within a housing project so families can walk to courses • Provide bus passes
English proficiency	Many adult learners speak little or no English. Spanish is the most common other language spoken by participants, but in some cases participants speak a range of other languages.	<ul style="list-style-type: none"> • Translate materials (typically into Spanish) • Have a translator or interpreter on staff • Use Google Translate or other digital dictionary/translator • Use English-only materials and instruction as a way to motivate English language learning

Literacy and/or education levels	Many adult learners cannot read in English or in their own language, lack background knowledge they feel they need, lack study skills to meet the expectations of being a student, have special needs, or have had little or no schooling. At times, parents feel that children advance at a faster pace, and they struggle to keep up with their children.	<ul style="list-style-type: none"> • Provide visuals throughout instruction to supplement or substitute written words • Explain concepts clearly using simple language; break complex topics into small steps; explain concepts in a variety of ways • Teach study skills and time management
Disinterest or resistance	Not all adult learners and children want to participate. Some have been court ordered to do so, and some fear that their undocumented status will be exposed. Some lack funds to take the GED or go to college, so they have difficulty justifying the need to prepare.	<ul style="list-style-type: none"> • Articulate the importance of the knowledge and skills resulting from participation • Orient instruction toward learners' most pressing and recognized needs • Build trust and rapport • Provide incentives for participating (movie tickets, bowling night, meals, books)
Discomfort/cultural conflict	Some adult learners resist participating because instructional approaches conflict with cultural norms they are accustomed to, and/or because they experience fear or discomfort in that their knowledge from prior educational or life experiences is not transferable.	<ul style="list-style-type: none"> • Make content unthreatening and instruction dynamic • Ensure that curricula exhibit cultural competency • Explain how parents' existing knowledge and skills are relevant and valuable • Shift mindsets to alleviate fears of making mistakes
Lack of awareness of programming	Organizations are not reaching or retaining all potential participants.	<ul style="list-style-type: none"> • Provide information about programming face to face or via written handouts
Technology access or computer skills	There is limited access to computers or Internet connectivity at facilities and in homes. Many adult learners lack basic computer skills.	<ul style="list-style-type: none"> • Use oral and printed materials only • Limit homework expectations to what learners can do without computer access • Provide courses in basic computer skills and reserve time in labs in or near the facility • Provide devices for students to take home • Have resources downloadable/in app form so Internet access isn't needed at home • When courses make use of digital devices, include guidance for using them

In focus groups with adult students who are also parents, participants echoed some of the same constraints identified by educators and staff in Table 2 and identified several new constraints. When

asked about the hardest part of being a parent and a student, **time management was the most commonly discussed limiting factor**: participants reported that keeping up with children, housework, and homework is difficult for them. Participants also confirmed that transportation is a significant barrier. Other constraints included feeling discouraged when they are unable to fully grasp concepts, and feeling discouraged when their children advance at a faster pace and they don't feel like they can keep up. Some participants said they feel guilty for putting their needs before their children's.

Support: Programs can engage families by emphasizing how programming relates to the attainment of participants' own goals.

The primary support identified for maintaining engagement with adult learners and families is to **focus on participants' learning goals** and find ways to support and nurture individual growth. In focus groups, participants discussed how much they value the one-on-one support provided by their educators. Educators also described processes for referring adult learners to new programs and services as new interests emerge.

Constraint: Students have variable access to technology at home, thus limiting their ability to access and use educational resources when offsite.

Another constraint discussed by program directors and staff was the reliability with which participants have access to technology and Internet access at home; this **limits the ways in which adult learners and families can engage with at-home learning resources** (related to science, or other topics). Onsite programs typically have Internet and at least occasional access to computers or tablets, and it is common for educators to integrate some uses of technology and media into their onsite programming. However, home use of tech and media is more variable. Many families do not have Internet access or computers at home, and although most students are expected to have smartphones, they may have data plans that limit their ability to access or use digital resources. In these cases, students can only get online information or use digital tools onsite. This can be difficult, because some program staff restrict use of smartphones to prevent learners from directing their attention elsewhere during classes or activities.

Caregiver survey results support the perceptions of program staff described above. Only a little more than half (52%) of adult learners said that they access the Internet at home. Fewer caregivers reported accessing the Internet at a lab (18%), at a friend/family member's home (6%), and at work (3%). Four percent (4%) said that they do not access the Internet at all. However, 77% responded that they access the Internet on their phone.

Support: Adult and family education programs are well-versed in the use of technology to enhance programming in ways that are sensitive to participants' technology skills and access.

Educators attempt to use technology in ways that support and enhance participant engagement, but the educators are also **sensitive to the average learner's skill set and access issues**. Educators report the use of text messages to communicate with adults and remind them of upcoming classes. Resources that depend on reliable Internet access, like PowerPoint, YouTube, and Kahn Academy, are used in class rather than by students at home; educational apps are used less often than Web-based resources. To help students gain proficiency with technology, and to access Web-based resources like high school equivalency exam prep sites, many sites provide at least temporary access to a computer lab, and some

have tablets or laptops available for parent or family use. Teachers often bring their own technology, such as iPads or laptops, as well.

Constraint: Parents face a variety of obstacles in playing with their children, an important context for exploring science; most commonly, they wish they had more time for play.

Of the adult learners who participated in the caregiver survey, approximately 27% believe they play enough with their child. When asked about the obstacles that may prevent them from playing more with their child, participants most consistently reported wishing that they had more time (48%). All other obstacles were reported much less frequently. They include these:

- I don't have access to technology (9%)
- I don't have enough space (6%)
- My child is disinterested (5%)
- They play enough with other family and friends (5%)
- I don't know what to do (4%)
- I don't have a safe place to play (1%)
- I don't have toys (1%)

Seven participants (~9%) reported other obstacles to engage in more play with their children. In these responses, they included some of the following comments:

- "He wears me out!"
- "Homework time"
- "Not as much free time as I'd like"
- "Sometimes my medical issues"

Survey participants ($n = 76$) were also asked to respond to an open-ended question¹ asking them what they thought would help them play more with their child. Here, "**time**" was again the most reported response with 27 respondents (35%) reporting that it would be helpful to have "**more time.**" Four participants reported "**having less work,**" which can be a reason that they don't have enough time. Nine participants (12%) called out a desire for **more "ideas."** Two participants specifically called for **more ideas on how to "play with [their] child."** Ten participants reported that having more "**activities/games/resources**" would be helpful. Four participants would find more "interesting things" to do with their child beneficial. Three reported they "play enough" with their child. Two participants reported that it's difficult to dedicate time individually with multiple children in the home. Two participants reported having more technology would be helpful. Two reported having more "energy" would be helpful, and one reported being able to "communicate in English" would help.

Support: Parents recognize the educational value of play and enjoy playing with their children.

Participants were asked why they choose to play with their child; the most frequent responses were to **help my child learn** (87%) and to **have fun with my child** (84%). Remaining responses, in order of frequency, were to bond with my child (70%), to keep them happy (48%), and to calm them down (34%). Eleven percent (11%) of participants reported that they play with their child for other reasons. Those include the following:

- "Because I love them."
- "To grow their imagination."

¹ This question was not as clearly phrased when translated into Spanish. Twelve of the participants answered this question as if it asked how they felt playing with their child would help them. Nine participants reported that playing with their child is helpful to build a stronger bond between parent and child. For example, one participant said, "To have better communication, trust, and strengthen our affection." Six participants reported that playing with their child helps them learn.

- “To build a connection and communicate.”
- “He has ADHD so it helps with structure.”
- “Love feeling like a kid.”
- “So she trusts me more.”
- “To help build strong/confident social/emotional developments”
- “To learn and they make me laugh and keep me happy.”

When asked what they do together with their child, participants most frequently responded that they play with toys (76%), make something like art or a craft (72%), and play sports together (71%). Fewer participants reported playing board games (61%) and video games (18%) together.

4. Adult Learner Attitudes and Motivations

This section addresses the following research question: *What are the attitudes and motivations toward and obstacles to science learning for parents who are also adult learners?*

Science Attitudes, Motivations, and Obstacles: Thoughts from Program Staff

Educators across partner program sites were asked about adult learners’ attitudes toward science. Educators reported that **adult learners generally regard science favorably**, and that those who have been exposed to science learning through their centers would welcome and enjoy additional learning opportunities that come their way. Adult learners seem to appreciate efforts to make science learning fun, because coursework in some courses (particularly high school diploma courses) can be mundane. However, educators reported that **some adult learners are intimidated by science**. According to one director, “everybody wants to learn science, but they are scared to death of learning science.” Station staff said that this might be because science is not an “active vital part of families’ lives or discussions,” despite its recognized importance in life and in helping children progress through school. Directors and educators also referenced parents’ limited prior exposure to science, which may contribute to learner apprehension.

Partner program staff also discussed the issue of priorities. Some interviewees, particularly but not exclusively those whose organizations have less experience with science, expect that parents or children might be resistant to participating in science activities. Given that many parents have pressing needs related to navigating the school system or developing basic financial literacy, interviewees reported that science learning might seem irrelevant, unimportant, or out of reach. However, others felt the hands-on and visual nature of science activities would be a welcomed relief for parents in that it provides a way for them to communicate despite linguistic barriers.

One NCFL director said that the science component of their program’s high school equivalency exam has changed recently. Whereas the science section formerly was “a reading test about science,” it now requires “some basic knowledge of the foundations of scientific thinking in order to answer and pass the exam,” said the director. This respondent referred to this change as “a huge impetus for the adult to want to learn the content itself,” but also stressed the need to promote the idea that for adults and children of any age, “science can also be fun.”

When asked which particular science topics cause anxiety or learning challenges for adults in their classes, educators said **the scientific method is often difficult for their learners to understand** or use, as are concepts relating to probability, statistics, metric conversions, genetics, and other “more difficult-to-

grasp concepts.” One educator said math, more often than science, challenges their adult learners who are preparing for the high school equivalency exam. One station staff member had different notions and said that science “would definitely be one of the subjects they do need help in.”

Despite some apprehension from students, **primary and partner program site staffs expect parents to respond favorably to the incorporation of science into programming and pointed to a number of ways they could do so.** Educators and program directors articulated a range of needs, from bringing science into the everyday lives of families, reframing scientific thinking and engagement, and focusing on particular science concepts that are challenging for parents during high school equivalency prep-related courses. It is noteworthy that even though interviewees often talked about science more broadly in other contexts (referring to broader practices such as questioning and experimenting), in response to questions about the needs and comfort of educators and parents, they typically talked about science in more traditional ways (referring to science topics that they need to know for the high school equivalency exam).

Finally, educators talked about the importance of changing adult students’ conception of science. One station staff member said it would help to reframe science instruction and provide opportunities for families to do something with their children that would “encourage them to be courageous enough to try things or to hypothesize or to wonder about the outcomes as opposed to being so concerned about is that the right answer or not.” Similarly, a director said that science can be framed as “a means to teach those kinds of employability skills” and achieve other goals that parents have. This director described science as “the delivery vehicle that could motivate them to learn, and then the outcomes in those 21st century skill categories or in other categories would stick.” Another director echoed the need to expand parents’ perceptions of what constitutes science when she said, “when they hear science they don’t understand that science is also nature . . . They think science is chemistry, plain and simple. So if you label it as science, most of them, pull back a little until they really understand there is more than that.”

Science Needs, Attitudes, and Challenges: Reflections from Adult Learners

Information from caregiver surveys offers a direct view into adult learners’ thinking about science, particularly learners’ **general enthusiasm for and awareness of the importance of science.** Ninety-one percent (91%) of caregivers think that it is important for them to learn science, and 92% of survey participants either strongly agree or agree that they think it is important for their child to learn science. (See Table 3 for details on all survey items related to caregivers’ perceptions of science learning.)

Surveyed caregivers also believe that **caregivers play an important role in cultivating science knowledge** in children. Eighty-six percent (86%) of survey participants strongly agree or agree that parents should help their children learn science, 88% would like to learn how to help their child learn science, and 90% are interested in doing science with their child. Yet, **fewer (71%) are confident** that they can help their child learn science. Interestingly, 44% of parents strongly agree or agree that school is a better place than home to learn science, with another 41% neither agreeing nor disagreeing.²

² It is worth noting that this question could be interpreted several different ways. Some caregivers may think that one location is a better place to learn science than the other based on their own knowledge level. Others, however, may have interpreted the question that one place is more conducive for science learning. This makes the interpretation of this finding difficult.

Table 3. Caregiver perceptions of science learning, in percentages* (N = 79)

	Strongly Agree or Agree	Neither Agree nor Disagree	Disagree or Strongly Disagree	Missing
I think it is important for my child to learn science.	92	5	3	0
I think parents should help their children learn science.	86	10	4	0
School is a better place than home for my child to learn science.	44	41	14	1
My child is not interested in science.	6	23	69	3
I think that it is important for me to learn science.	91	8	3	0
I am interested in doing science with my child.	90	6	4	0
I am confident that I can help my child learn science.	71	19	11	0
I would like to learn how to help my child learn science.	88	8	1	3
It is a teacher's job to help my child learn science, not mine.	9	24	63	4

* Percentages were rounded to the nearest percent.

When participants were asked about the frequency with which they use different kinds of resources to explore science topics with their children, the **most frequently reported activity was reading books about science** with 16% of caregivers reporting daily activity and 28% reporting book reading about science a few times per week. Participants reported that they enjoy reading books for the illustrations and “explanations.” One participant reported that reading was an opportunity “for me to read to them and for us to learn together.” Interestingly, the least frequently reported science activity was online games with only 5% reporting daily activity, 16% reporting a few times per month, and 44% reporting never spending time playing online games or apps about science with their children. (See Table 4 for all reports on science activity frequency.)

The finding about **science game/app play requires additional study**. It is unknown whether parents and caregivers choose not to spend time playing online games because of a value judgment of that activity or if there are issues (such as limited access to technology) that prevent them from playing these games. However, participants do report spending time watching television with their child. Thirty-three percent (33%) reported “watching TV” as a science activity they do either daily or a few times per week.

Parents and caregivers also provided insight as to what science topics they explore with their children. In open-ended responses, caregivers said that they talk about insects and animals, the seasons, earth science, life science and health, and things that their kids bring up. Some parents said their children like mixing things, so they make sure they are not mixing the wrong things. They talk about their children’s bodies and how and why they are growing. They also talk about health in regards to food with their children.

Table 4. Caregiver use of science resources, in percentages* (N = 79)

	Daily	Few times/ week	Once/week	Once/ month	A few times/ month	Never	Missing
Books	16	28	14	10	23	11	0
Science activities	9	18	15	16	24	18	0
Explore nature	8	27	4	19	32	11	0
TV shows or videos	8	25	14	14	23	16	0
Talk about science	5	18	9	13	38	18	0
Online games	5	14	5	14	16	44	1

* Percentages were rounded to the nearest percent.

Finally, caregivers were asked what would encourage them to do more science with their child. Seventy-three percent (73%) **need more activity ideas**, an even higher percentage than those who replied that they need more time (48%). Just under half of caregivers responded positively that instructions on what to do (44%) and more science knowledge (43%) would encourage them to do more science. Only two caregivers responded to the open-ended question that asked about anything else, saying “easy to get materials” and “more materials or funds to get materials.”

Additional Reflections from Focus Groups

Adults learners from focus groups shared their thinking about science during a series of focus groups conducted by EDC. Researchers found that, in many ways, their comments supported findings from the caregiver surveys, particularly that they would be interested in helping their children learn science and doing more science with their children. One of the most common obstacles for doing so are time, other responsibilities, and lack of supplies. However, several unique findings emerged that are worth calling out.

In these focus groups, **participants were mixed in their enjoyment of science**. In one group, adult learners were apprehensive about science learning. One group’s participants said that it’s not that they do not like science, it is that they do not know how to incorporate it into their lives—a finding that is inconsistent with the enthusiasm or the perceived importance of science learning as reported by survey participants.

Overall, focus group **participants were not very confident in their science knowledge**. Three out of the four focus groups were unanimously not confident. This level of confidence is much lower than that recorded by the caregiver survey. One group was confident in its knowledge of slime, animals, and experimenting with food and recipes. A few individuals are confident doing science activities with their child because their kids will not know if they are wrong.

Participants shared **several areas of science they were interested in learning more about**. Topics that were mentioned include the human body, medicine, nutrition, earth science, natural science, sport sciences, bullying, and technology. Caregivers specifically want to understand the science concepts at their children’s grade levels. One group mentioned it didn’t know until our conversation that science could be used for everything.

5. Existing Assets for Teaching Science

This section addresses the following research questions: *What are the characteristics of existing assets (curricula, hands-on activities, multimedia, etc.) that programs use to support the successful development of parents' science content knowledge? Similarly, what are the characteristics of existing assets that help support parents' engagement in science activities with their children?*

Assets Used by Adult and Family Educators

EDC spoke with educators across a variety of settings to learn more about the assets they use to teach science to adults and families. Highlights from these discussions include the following:

Educators vary in their process for selecting assets for their adult and family education programs.

Some educators reported that they have a mandate or near-mandate to follow a curriculum (mostly those who teach high school equivalency exam preparation courses). As one educator stated, “We just have to follow the curriculum depending on the week. Sometimes we improvise, but not really, we always try to follow the curriculum, so we don’t confuse parents.” Some specific resources mentioned included *FastForward* and *Score Boost*.

Other educators mentioned that they do have flexibility to make choices about supplemental resources for their adult and family education programs. One educator, describing how she chooses resources to supplement her adult education course, said, “based on their weaknesses, I will determine what I need to use to help them study for the high-school equivalency test. So if I see something, like they need [the] scientific method, then we’ll sit down and go over the scientific method or I’ll pull books off the shelf that I have and I can help them with whatever it is that they need help with.” Another family programs educator said, “I was able to let the parents know about [Kahn Academy] or give them information on FAFSA, how to apply for that . . . videos, like YouTube videos as well. . . . I go based off of the classroom needs. So if I see that parents are really interested in finding out more (about the) services the library offers, then we were able to go ahead and go on the library website and see what’s offered.”

NCFL educators specifically pointed to a small number of NCFL-owned assets they currently use to teach science. The most commonly referenced assets were Wonderopolis, the Learn to Earn Toolkit, and the NCFL Family Service Learning Approach. A variety of other assets were only mentioned once. (See Appendix A for details about commonly used science assets.)

Educators have varying ideas about the essential qualities of potential new resources that would be ideal for teaching science. Several educators asked for a website or online resource that can help their organizations offer **hands-on, simple, affordable science projects**. Others articulated what parents or children would need to support their learning or engagement with science. They referenced the need to **involve the whole family** and requested that resources contain information about the importance of science, information about how to help their children learn the basics of science, guidance for helping with their children’s homework, and **cross-cultural science experiences** that would enable parents to apply and see the relevance of their existing knowledge and skills. One respondent expressed a desire to use natural resources in the surrounding area as a way to promote nature-based exploration or learning, suggesting the value of supports that might help them localize activities.

Several educators offered specific feedback on how new resources could be made to work for English language learners. One educator said that with lower-literacy, lower-English-proficiency parents, “the

more the content can be **simplified and shortened**, the more helpful it is. If it's more modules or units or content, but they're shorter, that could make it easier for goal attainment." Educators also emphasized the importance of **accessible vocabulary** during their interviews: "If it's adults or ELLs (English-language learners), what I see is that content developers use big words and then parents or adult learners are like, 'What does that mean?' So I try to simplify it so it's easier to understand." One additional program director said in regards to the language barrier that sometimes prevents families from engaging in science experiments with their kids, "A lot of our moms are very interested in being active with their kids but sometimes, because of the language barrier, 'oh I can't do this' or 'I can't do that.' So if there's a way to do it in **multiple languages** maybe or things that they can do together, anything that encourages them to be hands-on with their kids. I think our parents would be all for that."

Educators and other program staff also shared their thinking about how new resources could be used in adult and family programming. They emphasized that caregivers seem to thrive when provided an opportunity to **try out resources prior to completing activities** with their children. One station staff member said, "When parents get to physically do the activities and learn what that concept is about, you can really see the light bulbs go off, you see them get excited about it, and they want to go home and do it with their kids." This feedback was corroborated by program directors and outreach coordinators in partner programs. One program director said that without hands-on experience, "It goes in one ear and out the other. . . . I have to be able to learn it now before I can teach it. And just by hearing it, you won't be able to do it. Just by [seeing] it . . . you won't be able to do it." Another program director emphasized the **personal value of these experiences** for parents by saying "Often, these parents have missed out on this piece of their life so I find that the things that we often think are for preschoolers and elementary kids[center, crafts]; those kind of very hands-on very tactile activities are actually very engaging with these adults as well."

Educator feedback also included suggestions for how to best deliver new resources to families and educators. Station staff and program directors commented that **digital resources designed for mobile phone** use are quite popular with families. Families may not have access to a laptop or desktop at home but most have smartphones and access the Internet through their phones. Targeting the availability of phones, according to one station staff member should "put it in the realm of ease of use and the likelihood that whatever's created will be integrated into daily life." However, it is important to consider that smartphone usage, particularly Internet access through mobile phones, is not completely ubiquitous. One station staff member pointed out Internet access issues that are pervasive in their state and suggested creating hands-on versions of whatever the online games are to make sure that there are online and offline versions of whatever is created. Speaking of situations where they have done this in the past, the staff member said, "So we can show them a game if we bring our hotspot, but if it's something we can give them, show them how they can do it in person with actual little cheap items or something they don't have to have the Internet in order to do, it's always helpful." Any use of technology would have to be "highly intuitive" because some parents do not know how to use a mouse or type on a keyboard. This finding highlights that, although mobile phone usage is becoming increasingly popular, it is important **not to leave behind families who lack the comfort or access to this technology.**

Finally, program directors and educators articulated the importance of creating resources that build on the strengths of adult learners and caregivers. "Basing the **learning on their lived experience** so that they can relate to it is incredibly important. It doesn't work to just kind of lecture them and say this is what you need to know in the science areas. So we begin with the end in mind," said one program director. An outreach coordinator from another program said, "It's got to be something that [they] see

as going to help [them] or [their] family or [their] children. If you can do that, then you can keep up. Otherwise, they are apt to take off.” A few program directors also discussed the challenge of curating all of the available resources for use in their programming (“it’s like a universe of educational products out there. We could probably spend a lifetime combing through them and they’re always changing.”). ProLiteracy and PBS LearningMedia are other tools that some seem to use to help find and select resources.

Assets Used by Program Directors

EDC also talked with program directors from primary partners and partner program sites to learn more about the characteristics of professional development materials that work for the educators in their programs. Highlights from these discussions include these:

Professional development happens in a variety of formats and frequencies at partner program sites across the country. Some training happens face to face with internal staff, and other forms of professional development happen online or via phone-based staff meetings/webinars. Staff members typically have opportunities to attend conferences, seminars, workshops, etc., but report that the frequency of these opportunities varies and also the amount of dedicated funding. Often, professional development begins in person and is supplemented by remote follow-ups. Some programs have weekly staff meetings in which they discuss particular topics of interest or provide training in particular areas. Weekly meetings also give programs opportunities to review and discuss the upcoming week’s curriculum as a team. It is also common for directors to present new resources available for educators to use in the classroom at this time. Finally, several interviewees mentioned ProLiteracy, a parent organization, that provides training or communicates training opportunities on topics like learning differences, family literacy, adult literacy, and ESL.

Some educators wish they had more access to training opportunities. They report needing more leadership training and training to teach science and social studies. Educators said they would also value more trainings where they are introduced to new, ready-to-use resources and given resources to take back to their centers. Computer training, workforce training, working with students with special needs, and working with immigrant populations are other areas in which interviewees feel underprepared. Referring to a topic most relevant to the current work, interviewees said they need **training to teach science**. According to one respondent about reading, language, and numeracy, “I really don’t think there’s been a lot out there just in general about teaching science concepts . . . I’ve sat through stuff about citizenship. I’ve sat through stuff [about] health literacy, but never really anything that had a science focus.”

Directors at our partner sites also referenced the need for more training for educators. Some referenced the need to prepare and train educators to involve the entire family in programming and foster parents’ engagement with materials. NCFL partner staff members identified **cultural and ethnic diversity training** as a central need related to professional development. Staff expressed the need for guidance in communicating with people from diverse cultures, fostering their participation and learning, and becoming more familiar with the “do’s and don’ts” associated with teaching different cultural groups.

Assets Used by Families

Parents who participated in focus groups and caregiver surveys said they use a variety of resources to learn more about science. Parents said they watch television with their children and specifically mentioned PBS, the Discovery Channel, *Bill Nye the Science Guy*, *Sid the Science Kid*, and *How It Works*. Parents also mentioned Google, YouTube, Pinterest, Siri, videos, and library books. Parents like these resources because they get their kids involved, feature hands-on projects, and/or provide online videos with step-by-step instructions that can be paused while they and their children go through each step.

Surveyed caregivers and focus group participants also referenced activities that help them learn about science. Several mentioned going to exhibits and museums. One group mentioned that it uses Groupon to find discounted tickets.

One final resource mentioned by members of one Spanish-speaking group is translator apps to understand their children's homework.

Conclusion

It is clear from this Needs Assessment that our primary partners (NCFL, KET, and APTV), along with their affiliated partner program sites, are deeply committed to building adult learner skills in ways that extend beyond the life of their program, providing opportunities for adults to advance their careers, support their children as they learn and grow, and develop new life skills that can help them create better lives for themselves and their families. Our partners serve a wide range of adults and families but primarily work with low-income, low-literacy, ethnically and racially diverse populations, many of whom are single mothers or recent immigrants with limited English language skills. We found that programs, despite the many barriers facing these adult students (including lack of time; transportation and scheduling issues; and fear or discouragement about their own abilities and pace of progress), have a deep understanding of their audience and have been able to put many supports in place to alleviate the most common barriers.

Although our partners work with parents and children across many contexts, partner program sites that deliver services directly to adult learners and their families can generally be divided into two distinct categories: (1) adult education programs that focus on building the English language or academic skills of adults, and (2) family literacy/education programs that focus on building the skills of parents and caregivers to support children's development and academic progress. This structure aligns with what we found about adult learners' motivations for pursuing their coursework: adult students most often said they wanted to strengthen their ability to communicate in English, learn academic skills (often to earn a high school credential), or help their children prepare for and succeed in school.

EDC found that there is not always an obvious connection between science and the attainment of these participant goals, and many programs for adults and families do not consistently feature science programming. When science was included, it was most often incorporated into one-off family events in which parents and children explore science together, and high school exam prep courses, for which science is an essential part of the curriculum. Science learning was rarely mentioned in the context of ESL classes, general literacy classes, or parenting classes.

Despite this, we found that staff and adult learners were enthusiastic about the prospect of incorporating more science into their programming, and they had many ideas about how science could be used to help participants reach their goals. Staff reported that children and families enjoyed doing science and often asked for more science activities, and educators also said they wished their organization offered more science programming. Educators saw the potential for science to help adults connect with their children while learning how to support their children's academic development; educators saw science as a way to promote literacy and language skills among adult learners (because it provides a context to make predictions, observe, and discuss); and they saw science as a means to teach academic and "employability skills" like the scientific method. Program staff also felt that incorporating science into programming outside of high school prep courses could help adults broaden their definition of science as a pursuit that involves courage, curiosity, and wonder, not just getting the right answer.

Parents also saw the importance of science in their own lives and their children's lives and were open to participating in science-themed activities and events. Interview and focus groups with adult students who are also parents revealed that program participants are not consistently confident in their own science knowledge, but they do consistently regard learning about science favorably, both for themselves and for their children. Many families already use assets, particularly books, videos, and television shows, to try science activities and learn about science concepts with their children.

Enthusiasm notwithstanding, adult and family education programs, as well as the adults and families they serve, need training and resources to help them do more science exploration. Parents report that the most common obstacles to playing with their child and doing science is not having enough time and needing additional ideas and resources for things to do. Educators said that they would like more training in how to work with adults and families around science. They also requested resources for teaching science that meet the needs of the programs and participating adults and families.

Recommended Takeaways

Several recommendations for the production of new science learning resources were supported by data collected from site interviews, focus groups, and caregiver surveys. These recommendations are organized into four distinct categories, as follows:

Ensure integration with existing models

1. **Resources should be aligned with the types of models currently used by target programs.** Think about how the resources will ultimately fit into current program implementation models (single events, PACT time, helping adult learners think through GED science concepts). This will help educators establish clear content connections. For example, if specific family education programs are targeted (e.g., NCFL 2-Generation learning model), it is important to create resources that align with current family learning models (i.e., resources that would have clear parent-only and PACT time activities). Provide instructional supports that help adjust the content to learner skill levels.
2. **Relatedly, resources that align with specific curricula and provide appropriate teacher supports to make real-world connections would help educators with less training feel more prepared and competent for specifically addressing science as a learning goal.** For example, new science resources could be created to align with common exam prep curricula like KET's *FastForward* program. Further, because resources are intended to be useful to adult educators in a variety of contexts, it is important to think about how resources may help educators highlight science even if it is not currently being addressed as a current programmatic learning goal.
3. **Resources should seek to make science fun, hands-on, accessible, and easy to integrate into programs and into family life.** The current research indicates that parents recognize the importance of play to help their children learn and have already established routines and activities for learning about science, including video viewing and doing step-by-step activities. Resources should build on parents' interest in helping their children learn about science and capitalize on what is already known about what families like to do together to learn at home. Further, resources should incorporate recommendations from educators to support parents' usage of at-home materials. To accommodate the low literacy and education levels of adult learners, concepts and procedures are best broken down into simple steps to maximize accessibility. Oral instructions are preferred when possible, but when written instructions are necessary, they should use visuals/images to help educators utilize these materials in class contexts.
4. **Provide training to educators to help support implementation in ways that make science accessible and less intimidating.** Educators and program directors are responsive to online training materials and webinars to support implementation. The project team should explore the types of training that can support implementation of resources in a range of intergenerational education environments (webinars, facilitator guides, meeting guides, online self-paced training, etc.).

Expand participants' mindset

5. **Resources should emphasize exploration, being courageous, and the idea that science is not just about getting the right answer.** This will help alleviate fears and anxieties about doing science and broaden participants' understanding of the nature of science.
6. **Resource learning goals should not only emphasize what content will be taught but how that content has real-world importance.** Resources should emphasize the importance of the real-life experiences parents bring to the table and make the value of these experiences obvious to educators as well as participating adults and children.
7. **Resource implementation should encourage parents to experience hands-on activities or apps prior to implementation with their children.** Partners reported that parent participants thrive in intergenerational experiences that allow parents to try out hands-on activities prior to implementation with children. This allows them to experiment first and avoid the fear of making mistakes.

Capitalize on adult learning goals

8. **Resources should capitalize on adults' learning goals of building their own skills and/or developing the skills that they need to support their children's education.** Adult learners want to make better lives for their families and be stronger advocates for their children. Resources should make it clear to educators and adult learners how science can help do that.
9. **Resources should be adaptable to the needs or preferences of the adult learning context.** To appeal to adult learners who are also parents, interviewees stressed the need to be clear about the importance of science, the purpose of a particular activity or course, what the expected outcomes are, and how to achieve those outcomes. Many parents are unaware of what their children know or should learn related to science, so efforts to provide that information are important.
10. **Educator supports for resources should explore how to help them frame implementation for course learning goals and address the focal science content.** Because these resources are intended to support adult learners who are parents in a wide number of contexts, developers should think about how educators can help their adult students understand that exploring science can help them reach their individual goals (which may or may not be science-related).

Make context flexible

11. **Activity set materials should be developed to accommodate a wide range of adult learner circumstances.** This includes resources like visual instructions for low literacy learners, vocabulary lists or translations for English language learners, and/or hands-on versions of digital apps for those without reliable Internet access.
12. **Resources should be adaptable for diverse participant needs.** Spanish translations, although acknowledged as an asset by program staff, are not the only adaptation suggested by program staff. Resources should also demonstrate cultural competency, allowing for flexible implementation depending on the needs and cultural perspectives of participants.
13. **Resources should take into account the variability in families' access to digital resources.** The technological capabilities of community partner organizations may range from high to low, and/or their experience using technology and media in their programming may also vary. Similarly, adult learners vary in their access to technology at home and in their skills using technology for learning.

Appendix A Suggested Resource Models

During the course of interviews with primary partners, the following resources were mentioned as possible examples for how families are engaged around science learning. Links are provided for the project team's review.

The **Learn to Earn Toolkit** is a free online resource developed by the National Center for Families Learning (NCFL). This resource is aimed at adult learners to build proficiency in 10 employability skill areas (critical thinking, diversity, English language, information technology application, oral communication, professionalism, reading comprehension, social responsibility, teamwork, and written communication). The results of a national survey highlighted that these skills were deficient in adults entering the workforce with a high school education. For each skill, there is an overview, an opportunity to practice what you have learned, and ways to explore information about each skill. The content in the toolkit is created for either an intermediate-level or advanced-level adult basic education. The toolkit is accompanied by an instructor toolkit. The website also offers a set of resource links including family literacy activity ideas and other educational resources.

Learn to Earn Toolkit: <http://learntoearn toolkit.org/>

Instructor Materials: <http://learntoearn toolkit.org/uploads/misc/LearntoEarn-ResourcesCards.pdf>

Resources Page: <http://learntoearn toolkit.org/page/resources>

Wonderopolis is a free online resource developed by NCFL that promotes curiosity and exploration among learners of all ages. The site organizes posts by Wonders of the Day and by content area (Science, Math, Social Studies, Language Arts, Technology, Arts & Culture). Users are invited to submit their own wonder questions. Wonderopolis focuses on fostering learning opportunities in everyday moments. Content aligns with Common Core State Standards, the STEM Educational Quality Framework, and Bloom's Digital Taxonomy. The site also provides classroom resources, lesson plans, and the Wonder Ground, a support network for educators.

Camp Wonderopolis, an offshoot of Wonderopolis, is a summer-learning initiative geared toward keeping families engaged in learning through summer and out-of-school time. Each summer, the site offers a themed camp for campers (children) or counselors (parents, educators, etc.). Previous camps include a focus on music, the six branches of science, construction/engineering, health and fitness, and tinkering. Many camps provide examples of Maker Activities.

Wonderopolis: <https://wonderopolis.org/>

Wonder Ground: <http://wg.wonderopolis.org/>

Camp Wonderopolis: <https://camp.wonderopolis.org/>

2014 Camp Wonderopolis: <http://camp2014.wonderopolis.org/>

Several participants mentioned **NCFL's Family Service Learning Approach** as an intergenerational model that involves both parents and children in goal-oriented service learning. NCFL incorporated this approach, implemented by five grantees in 2013, into pilot family literacy programs and has since expanded the model to additional grantee programs. Its program description cites literature that service learning may have important benefits to English language learners to help them feel less like outsiders and, through program interactions, reinforce language skills. The family service-learning model follows a six-step process (descriptions abbreviated from full briefing, cited below):

1. *Investigation:* parents and children investigate community problems they might address

2. *Planning and Preparation*: learn about and plan the service activities
3. *Action*: carry out the service learning project
4. *Reflection*: debrief and reflect on the experience
5. *Demonstration of results and celebration*: publicly share what they achieved and learned
6. *Sustainability*: plan how to make this learning an ongoing endeavor

Participants mentioned that service learning often has connections to science learning while also showing family participants the real-life connections of their learning to the community.

Family Service Learning Brief: http://familieslearning.org/pdf/NCFL-FSL-brief_F3.pdf

Other resources that were discussed by program directors include WGBH's *Peep and the Big Wide World* for good app functionality and small snapshots of content; *Vroom* and *ReadyRosie* for early childhood content; Full Option Science System (FOSS) kits and PBS KIDS' *Family Creative Learning Workshops* to engage children in hands-on experiences; Kentucky's *FastForward* for adult education/exam prep; and Cambridge University Press' *Ventures* for ESL adult education curriculum.