



PEEP Family Science: Highlights from the Research

About PEEP Family Science

PEEP Family Science is designed for parents and their three- to five-year-old children, especially those from low-income families who are served by home visiting organizations. A media-based project featuring the preschool public television science program *PEEP and the Big Wide World*, it includes animated stories, live-action videos with real children, hands-on science activities, and educational resources designed to support parents and home visiting educators. PEEP Family Science comes in the form of four apps, one for each science unit: ramps, colors, sounds, and shadows. Once downloaded, the apps can be used offline—parents do not need to have Wi-Fi or to use their phone’s cellular data.

The app format limited the amount of text, broke activities into smaller incremental steps, and allowed for verbal prompts to highlight the ways parent could engage with their children in science, especially important for parents with low levels of literacy.

The apps foster a set of three focal pedagogical engagement strategies that parents can use when exploring science content and practices with their children. These three strategies are based on research about the kinds of supports young children need to learn from science explorations:

- **Playing and Exploring Together:** A parent’s attention and encouragement make a big difference to a child’s development. Children need to feel that what they do and think is valued and interesting.
- **Asking Questions and Talking About Ideas:** The more a parent and child talk together, the more chances a child has to grow. Sharing ideas helps children think more deeply and builds on what they’ve already learned.
- **Exploring More:** Repeating an activity, or adding different materials to explore in a new way, strengthens and enhances children’s learning.

Supports for parents and educators include videos that model parents using the pedagogical engagement strategies during the activities with their children; and Educator Guides that walk educators step-by-step through the PEEP Family Science apps and offer problem-solving tips and background on the engagement strategies and best practices for using educational media with children.

The Research

Educational media developers from WGBH and researchers from Education Development Center's Center for Children and Technology (EDC) collaborated with two home visiting organizations, AVANCE and HIPPY, to develop and test PEEP Family Science.¹

The design of PEEP Family Science rests on the central conjecture that, with resources that engage and scaffold their own learning, parents can learn about and implement practices to support their children's science learning. To examine this premise, the research team conducted an implementation study with 217 families and 20 home educators using a pre/post study design that included a parent comparison group, surveys of parents, interviews and focus groups with educators, and observations and interviews with a subsample of parents and educators.

A small but growing body of research has examined the role that media and technology can play in supporting parent engagement in their children's learning. By studying the design and implementation of PEEP Family Science, the study builds on this work in two ways: First, few studies have examined how to help families with young children do science at home. Second, little is known about how to bring a media-based intervention to low-income families at a large scale using families' existing technology and resources.

Key Findings

Changes in Parent Attitudes and Knowledge

There were **positive differences in attitudes and knowledge** with parents who used PEEP Family Science compared to those who did not:

- Parents reported doing substantially more science activities with their children.
- Parents reported using more strategies to support their children's learning through media.
- Parents, who reported low usage of strategies for supporting their children's science interest and learning, increased their use of these strategies.
- Parents who were initially less confident in helping their children learn science were more confident about helping their child learn science.

¹ HIPPY serves 15,000 low-income children in 22 states and the District of Columbia. About one-third of families served are Hispanic, one-third are African American, and one-third are non-Hispanic Caucasian. HIPPY reaches families through weekly home visits. AVANCE serves 2,000 families in the western and southwestern US, with an audience of participating parents that are generally young (most are under 30 years old), minority (98% are Hispanic), low-income (37% earn less than \$20,000/year) and have limited education (61% have not completed high school). AVANCE reaches families through a blended model that includes weekly small group sessions held at community centers, followed by monthly home visits.

- Parents, who were less likely to feel that science was an important subject for their child, were more likely to value the subject *after* they used PEEP Family Science, compared to families who did not use PEEP Family Science.

Effectiveness of PEEP Family Science to Support Early Science Learning

Using PEEP Family Science, parents and children were observed **engaging in important science content** and **used science practices together**:

- Parents and children explored core disciplinary ideas in science, such as testing and experimenting with how objects move on inclines; describing, identifying, and comparing colors; and exploring differences in the pitch and volume of sounds.
- Parents and children were observed using science practices, including asking questions; planning and carrying out investigations; analyzing and interpreting data; using mathematics; and obtaining, evaluating, and communicating information.
- Parents were observed using elements of the focal parent engagement strategies to support their children’s science interest and learning while watching the videos and doing the hands-on activities:
 - ⇒ **Play and Explore Together.** Most parents were able to guide their child’s play without taking over and allowed their child to make choices that determined the structure of the activity.
 - ⇒ **Ask Questions and Talk About Ideas.** All parents talked with their children about ideas and asked them questions that directed their children’s attention and helped them make observations. Many parents also asked questions and talked about ideas that were more conceptual in nature, or that required higher-level reasoning.
 - ⇒ **Explore More.** Most parents reported that they had explored the same science topic in different places by, for instance, going outside and finding ramps, colors, or sounds in the park or their yard.

Perceptions of PEEP Family Science

Parents reported that PEEP Family Science was **appealing and useful** for both parents and children.

- Virtually all parents reported that their children enjoyed using PEEP Family Science—the videos, PEEP characters, and hands-on science explorations were engaging and fun.
- Multiple parents reported that PEEP Family Science provided opportunities for them to spend one-on-one time with their child.
- Most parents reported that they were able to incorporate PEEP Family Science into their existing routines.
- The vast majority of parents agreed that PEEP Family Science gave them ideas about how to do science activities using different materials and how to do science outside of the PEEP activities

- Virtually all parents reported they were still using PEEP Family Science by the end of the three months of the program.

PEEP Family Science Use and Accessibility

PEEP Family Science design took advantage of the **unique affordances of media to support science learning** with the purpose of fostering motivation, engagement, and deeper learning.

- The use of media and characters as role models was a strength of PEEP. Virtually all parents reported that their children enjoyed the videos. During interviews, parent reported that their children watched them multiple times, identified with the characters, were motivated to explore similar content that the characters explored, and referenced PEEP and other characters outside of PEEP activities.
- Virtually all parents and educators reported that PEEP Family Science was easy to use and that the directions were clear.
- The parent videos, which were embedded in the apps and designed to model parent pedagogical strategies, provided important guidance for parents in how to do the hands-on activities with their children. Educators reported that this video-based guidance was particularly valuable for parents with lower reading abilities.

PEEP Family Science’s design was accessible to **low-income and diverse parents**:

- Virtually all the low-income families in the study had access to a smartphone, and were able to use the app with ease and few parents reported that they had technical difficulties.
- Families with unreliable Wi-Fi access were able to download the apps once (for example, at a public location such as a library, McDonald’s, or using an educator’s mobile hotspot) and use them over the course of a month without needing additional Wi-Fi or cellular data.

Most educators felt prepared to help families use PEEP Family Science and did not need additional information or supports.

- Educators reported that they valued the simple, step-by-step guidance the resources provided.
- Educators who said they initially felt less prepared indicated that they gradually became more comfortable as they progressed through the units.
- When asked to identify PEEP’s most important messages for parents, many educators noted one or more of the parent engagement strategies, and several described examples of parents using each of the strategies in ways that educators understood the meaning of the parent strategies, a possibly important precursor to ensuring that they integrate them in their educational practice. (A few of the educators, however, were not able to describe the strategies in any detail, or they were able to describe only one of them, and indicated that they did not fully understand them.)

Recommendations

The following recommendations address some of the challenges that the two home visiting organizations, HIPPY and AVANCE, experienced when implementing PEEP Family Science.

- **Ensure adequate resources:** Some educators and administrators noted that educators needed additional time to become comfortable implementing the technology and the new program. Organizations need to ensure that adequate resources are available, including (1) time for educators to learn about and get comfortable with a new program and (2) the small amount of technology needed for families to access and use the app, such as hotspots to enable families to download the app each month.
- **Consider how PEEP fits into existing programs:** During two pilot studies, AVANCE and HIPPY were able to try out and adapt their implementation of the intervention so that it fit into their existing practices. This approach would be helpful for other home visiting organizations to do as well. Prior to adopting the program, organizations should consider how PEEP fits into their existing curriculum, structures, and time with parents. They should also take into account parents' and educators' ideas and attitudes about using media with young children and explicitly address concerns about how best to use media to support learning.
- **Identify best practices for using media with young children broadly:** During this study, some parents and educators expressed apprehension about using media with young children, and some educators felt incorporating media distracted from building a relationship between parents and children. Reports from some parents and educators also suggested that some parents faced difficulty in disengaging children from the media. Organizations should use PEEP Family Science as an opportunity to talk with parents and educators explicitly about how to incorporate the use of media and technology as an educational tool to help young children learn.

Broader Implications for the Field

Given the success of the intervention, there are several lessons relevant for media producers and educators wishing to provide low-income families with effective educational media resources as well as lessons for how to help families with young children do more science together.

Media can play a critical role in engaging children, parents, and educators in science, both initially and over time, and may be particularly important for engaging families who are not confident about or who do not initially do science with their children.

However, reaching and engaging low-income and diverse parents through media-based interventions requires careful design. Apps designed to be downloadable can be a valuable learning tool for low-income families and their educators.

- Developers can meet low-income families' resource limitations, such as lack of reliable Wi-Fi, by designing apps that families can download once and use over the course of a month, without requiring use of additional Wi-Fi or costly cellular access.

- The app design—which does not allow for dense text and, with a smartphone’s small screen, supports breaking the content into small incremental steps as users swipe through the experience—allows for educators and parents with a range of educational backgrounds, technical expertise, and experiences to use the app to engage in science.
- Videos can play an important role in modeling ways of engaging in, talking about, and supporting science explorations for both educators and parents, and may be particularly important guides for individuals with low-literacy or other language barriers rather than written instructions that programs often use.

Parents and educators may need support in understanding best practices as they relate to media use and strategies for how to use media-based resources in ways that can enhance children’s learning. In this study, some families indicated that this was the first time they had used an educational app, while others expressed apprehension about using technology with young children. Videos of parents with their children modeling how to use media and talking about what they are watching together can provide powerful guidance for other parents.

Parents and educators lack developmentally appropriate resources to support early science experiences. In the pilot studies, many parents indicated that they lacked models of science engagement that were appropriate for young children. Prior to using PEEP Family Science, most educators did not share an understanding of important early science learning concepts and skills. Parents may also need targeted support, such as small prompts or question starters, to be able to ask more open-ended and higher-order questions and to engage in guided play rather than using approaches that are closer to direct instruction.

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This material is based upon work supported by the National Science Foundation under Grant No. 1612643. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.