HEAD START ON
ENGINEERING

Introduction to the Head Start on Engineering Pilot Program

Engaging Families with Preschool Children
in the Engineering Design Process

Scott Pattison, Verónika Núñez, Cynthia Smith, Gina Svarovsky, Marcie Benne, Pam Corrie, Raquel Stewart

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PREFACE

Welcome to the Head Start on Engineering (HSE) program! HSE is a multi-component, bilingual, family-centered program designed to engage preschool children and their parents and caregivers from low-income backgrounds in the engineering process. The overarching goal of HSE is to help families develop long-term interests in engineering and science so that they will have the skills, knowledge, and confidence they need to be successful. In other words, more than school readiness, this program is about helping children and their families develop a passion for engineering and science that motivates them to engage with these topics throughout their lives.

This guide is an introduction to the HSE program for educators and managers at Head Start centers, museums, or any other early childhood or informal learning institution that is interested in engaging families with the topic of engineering. As we explain in the introduction, this is not a typical preschool classroom curriculum. The HSE program focuses on helping parents and children engage with engineering at home and develop long-term interests related to engineering. The hands-on activities are designed to be facilitated by parents, with the support of teachers, family workers, science center educators, and other stakeholders. And all of the program components are intended to create a system of support for families that connects learning and engagement inside and outside the classroom and the home.

Everything in this guide is a work in progress. The program model and materials are the result of three years of pilot and evaluation work in collaboration with the Mt. Hood Community College (MHCC) Head Start community. During that time, we have made many changes in collaboration with educators and families. Rather than present a set of final program materials, we hope this guide will be useful in documenting our work to date and encouraging other communities to try out the HSE model.

With that in mind, feel free to adapt and expand the ideas in this program guide and make HSE work for your community. We spent the last three years developing and piloting the program and activities in a center-based Head Start program. However, we believe the program model can be easily adapted to other Head Start systems, such as home-based visiting programs, as well as other early childhood education partnerships led by science centers or community-based organizations.

We invite you to explore how the HSE program model and activities can enrich the learning experiences of the children and the families that you work with.

Enjoy!
The HSE Leadership Team

INTRODUCTION

Head Start on Engineering (HSE) is a multi-component program model integrated within the Head Start system and designed to spark and sustain interest in engineering for preschool children and their families. HSE fosters connections across preschool and family learning contexts to catalyze long-term, enduring family interests related to science and engineering—or what are often called long-term interest pathways (Pattison et al., 2017). Unlike many other preschool engineering or science programs, HSE focuses on the family and home-based learning experiences first and then creates complementary classroom activities to support this learning.

Although engineering is rarely a focus in preschool, we believe that now more than ever the topic is central to the education and learning of young children. Helping preschool children and their families develop interest in engineering and practice engineering design thinking skills prepares children for kindergarten and provides the whole family with an approach to problem solving that is relevant to school, work, and life. This early engagement creates the foundation of long-term interest in engineering, which may ultimately lead children to pursue engineering- and science-related careers—and thus help diversify the next generation of engineers and science leaders. These opportunities are particularly important for Head Start families from low-income backgrounds, who face a variety of barriers to accessing and engaging with quality engineering and science learning experiences inside and outside of school.

Program Goals

The HSE program provides comprehensive services for parents,[1] children, and their teachers, including professional development for preschool educators, hands-on engineering activities for families, parent workshops, preschool classroom curricula, and rigorous assessment and program improvement.

[1] Throughout this guide, we use the term "parent" broadly to include the central adults and caregivers in a child's life, whether or not they are the biological parents.

In the short term, HSE is designed to:

1) *Develop families' interest in engineering,*
2) *Increase parents' and children's engineering and design thinking skills, and*
3) *Support other early childhood development outcomes, such as numeracy and early reading skills.*

Over the long term, we aspire to help children and their parents develop enduring interests in engineering and seek out future learning experiences that shape children's performance in school, engagement in extracurricular activities and hobbies, perceptions of themselves, and aspirations for future careers. The program is also designed to catalyze meaningful collaborations between researchers, educators, and community members that lead to quality family learning experiences, iterative program testing and improvement, and research findings of practical significance to the community, locally and nationally.

Philosophy and Approach

Several research-based commitments have guided our work and led to the unique HSE program model. Specifically, we believe that effective STEM engagement for families and preschool children from low-income backgrounds requires:

- Meaningful collaborations with families and community organizations and complementary partnerships between researchers, educators, and engineering experts;
- A holistic perspective on learning that supports the whole family (children and adults) across all aspects of their lives (inside and outside of school);
- A strength-based approach that builds on the knowledge, experiences, and interest of families;
- Ongoing improvement driven by evaluation and research;

- Hands-on, family-friendly activities that focus on sparking engineering-related interests and building age-appropriate engineering design thinking skills.

Perhaps the most unique aspect of the HSE program is the primary focus on family learning at home, rather than the preschool classroom. A variety of high-quality engineering and STEM programs are designed for teachers to implement with preschool children in the classroom (e.g., Cunningham, 2018) and some of these include additional support for families. In contrast, HSE focuses on providing children and their parents with the resources to engage with engineering at home and then creates complementary experiences in the classroom.

The approaches to program development, implementation, evaluation, research draw from the areas of community-based participatory research (e.g., Hacker, 2013; Israel, 2013) and asset-based perspectives on learning and education (e.g., Gutierrez & Rogoff, 2003; Lemke, 2001). For example, we aspire to share decision-making power with communities and families, contribute meaningfully to the community through research and program activities, understand the cultural perspectives of the groups we work with and reflect on how these relate to our own backgrounds and perspectives, and design program and research components to be relevant and responsive to the cultural diversity within the Head Start community. All program materials and events for children and families are bilingual (Spanish and English) and developed with close attention to the literacy levels of children and adults.

WHAT IS ENGINEERING?

HSE focuses on the *engineering design process*, rather than the field of engineering, as a topic and skill that is highly relevant to the everyday lives of families, helps make engineering feel approachable, and easily connects to early childhood play and learning practices.

The engineering design process is a cycle that engineers follow to create and test solutions to a problem (see Figure 1). Families also use this process to solve problems every day, like figuring out a food recipe or building a book shelf. In HSE, engineering is described as *designing and testing ideas to solve problems in work and life* and the engineering design process is introduced as a five-step, iterative cycle (Cunningham, 2018):

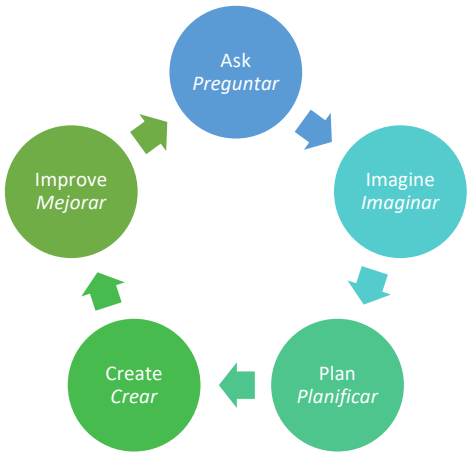


Figure 1. Engineering Design Cycle

- **Ask**—Ask questions to understand the problem and what you need to solve it.
- **Imagine**—Brainstorm as many possible solutions and designs as you can.
- **Plan**—Pick a design and decide how you will use your materials.
- **Create**—Build and test your design to see how well it solves the problem.
- **Improve**—Make changes to your design based on what you learned.

The one-page overview of the engineering design cycle provided to families during the workshop and included with every take-home activity is included in Appendix A.

PROGRAM OVERVIEW

What does an early childhood engineering program look like when it supports interest development for the whole family and integrates multiple experiences across contexts for parents and children? The current HSE program includes several key components designed to support Head Start and science center staff, parents, and children developing long-term interest pathways related to engineering (see Figure 2).

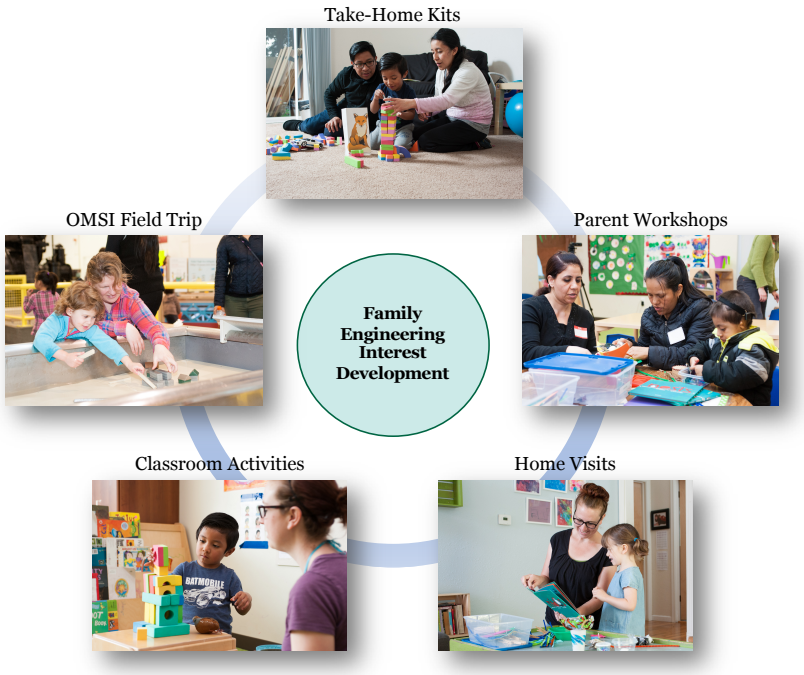


Figure 2. Head Start on Engineering Program Model

The backbone of these components is a set of four bilingual (Spanish and English) family take-home engineering kits. These activities are the anchor for the array of HSE program components provided throughout the year and integrated within the Head Start model. Table 1 below outlines these components and when they typically are presented during the Head Start school year.

Table 1. Overview and Timeline of Primary HSE Program Components

Component	Approximate Timing
Collaborative program planning	June–August
Head Start staff professional development	September–November
Family engineering night at Head Start	December–January
Parent workshops and take-home kits (×3)	February–April
Home visits	February–April
Science center field trip	May
Final participant and team reflections	May

All of these program elements are described in more detail later in the guide. As noted, all of the program events and materials are presented in Spanish and English, with close attention to the literacy needs of Head Start families.

ALIGNMENT WITH EARLY CHILDHOOD STANDARDS

HSE activities and the additional supports provided to children and families align with the Head Start Early Learning Outcomes Framework (ELOF). According to the 2015 ELOF, there are seven guiding principles that help prepare young children for success in school and beyond. These principles are:

- Each child is unique and can succeed;
- Learning occurs within the context of relationships;
- Families are children's first and most important caregivers, teachers, and advocates;
- Children learn best when they are emotionally and physically safe and secure;
- Areas of development are integrated, and children learn many concepts and skills at the same time;
- Teaching must be intentional and focused on how children learn and grow; and
- Every child has diverse strengths rooted in their family's culture, background, language, and beliefs.

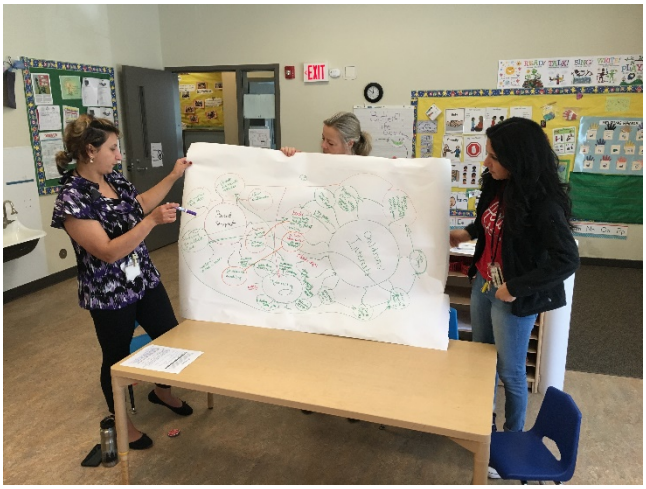
The ELOF is broken down into five broad areas of early learning and development: (1) Approaches to Learning; (2) Social and Emotional Development; (3) Language and Literacy; (4) Cognition; and (5) Perceptual, Motor, and Physical Development. As children and families engage with the HSE program and the take-home activity kits, they are building skills and developing in all five ELOF Domains:

- Approaches to Learning: *Children will develop emotional and behavioral self-regulation, cognitive self-regulation, and show initiative, curiosity, creativity.*
- Social and Emotional Development: *Children will build relationships with adults and demonstrate a sense of identity and belonging.*
- Language and Literacy: *Children will practice communicating and speaking, and add new words to their vocabulary, as well as increase their comprehension of text through storytelling.*
- Cognition: *Children will increase math development by becoming more familiar with measurement, geometry and spatial sense. They will also increase scientific reasoning by engaging in scientific inquiry, scientific talk, and reasoning and problem-solving.*
- Perceptual, Motor, and Physical Development: *Children will increase control, strength, and coordination of small muscles.*

PROGRAM AND ACTIVITY DESCRIPTIONS

Each of the HSE program components is described in detail below. More than a collection of disparate activities, each of the components is designed to connect with other aspects of the program and provide an integrated, synergistic support system to help teachers and families develop their interests related to the engineering design process.

Professional Development Workshops



HSE begins with a series of two professional workshops for partners and Head Start teachers to introduce staff to engineering and give participants hands-on experiences with the take-home activity kits. Drawing on the techniques and activities used to develop preK–12 educators' engineering capacity in other programs (e.g., Cunningham and Lachapelle 2010), the sessions include hands-on design challenges, reflections about the design process and its relevance to everyday contexts, and an introduction to the HSE activity kits. In the HSE pilot work, the sessions also built on preliminary discussions with a subgroup of Head Start teachers and staff during the first year of the project, during which the team developed a shared understanding of the engineering design process and explored how it could be applied to family learning in early childhood.

The agendas for both professional development workshops are included in Appendix B. During the HSE pilot development process, the workshops were led by engineering education experts at the University of Notre Dame.

Parent Workshops

After the teacher development workshops, the HSE program launches with a family engineering night open to all Head Start families and children at each participating location. A subset of families is then recruited to participate in a series of three evening parent workshops.

The family engineering nights are held during one of the monthly Head Start parent meetings, when families at each Head Start location are invited to come for dinner, updates, and social learning opportunities. The event includes food, an introduction to engineering, and time to explore and discuss an example engineering activity for families.

Subsequent evening parent workshops are also held once a month with groups of approximately 10 to 20 parents and include both dinner and child care. They are designed to allow parents to build their familiarity, confidence, and personal interests related to the engineering design process so that they can practice and integrate engineering thinking more often throughout their daily interactions with their children. During the workshops, program staff share more about engineering with parents, introduce and let parents explore each take-home activity kit, discuss strategies for engaging their children in the activities, and facilitated conversations among parents about their experiences with the kits at home. The team also introduces parents to a version of the engineering design cycle (ask, imagine, plan, create, improve) and continually revisits this cycle to help parents and staff become more familiar and comfortable with the design process. After each workshop, parents take home their own copies of the activity kits introduced during that meeting.

The agendas for all three parent workshops are included in Appendix C, as well as the bilingual overview of the engineering design cycle (Appendix A).

Take-home Activity Kits

At the end of each parent workshop, families receive one of four different take-home family engineering kits for them to keep and use with their children at home. Each focuses on a hands-on engineering design challenge and includes:

- A bilingual storybook carefully selected to launch the activity and create a context for the engineering process;
- Simple materials that parents can easily reuse, replace, and supplement; and
- A parent facilitation guide with instructions, facilitation tips, and extension ideas.

The bilingual (Spanish and English) facilitation guides for the four take-home activity kits used during the 2017–18 school year are included in Appendix D. In some cases, when a bilingual version of the chosen book was not available, the project team added Spanish translations to each page using stickers. This provided families with easier access to both languages, rather than having separate English and Spanish versions.

The Fox and Hen

In this kit, the main challenge is to build a structure with foam blocks that will protect a hen from a fox. The kit includes a children's book, *Oh no! A fox!* (Stoeke, 2014); a set of foam building blocks; a one-foot tall card stock image of a fox; and the parent facilitation guide. During the 2017–18 school year, the team piloted an introductory video of the activity that is freely available to families: https://vimeo.com/256122624.

Mouse Run

In this kit, the main challenge is to build a path with paper tubes that will allow a mouse to escape from a cat. Families use a ping-pong ball to represent the mouse and create a path for the ball to roll from the cat icon to various food icons and back to an image of the mouse family. The kit includes a children's book, *How To Catch A Mouse* (Leathers, 2015); a large foam board; paper tubes; painter's tape; a ping-pong ball (the "mouse"); small laminated drawings representing the cat, the mouse family, and different types of food; and the parent facilitation guide. During the 2017–18 school year, the team piloted an introductory video of the activity that is freely available to families: https://vimeo.com/257000695.

Bubble Wands

In this kit, the main challenge is to create bubble wands and other toys that children can use to blow bubbles in the bathtub. The kit includes a children's book, *Bubbles, Bubbles* (Appelt & Kosaka, 2001); ingredients and a recipe for a basic bubble solution; a small bowl; pipe cleaners, string, straws, and other materials to create bubble wands; and the parent facilitation guide.

Bird Nest

In this kit, the main challenge is to design a nest for a bird who has fallen out of its own nest and needs a place to sleep for the night. Families experiment with different materials and different challenge locations for the nest (e.g., on a bowl or on top of a small cup). The kit includes a children's book, *Baby Bird's First Nest* (Asch, 1999); a small bowl and cup; a toy baby bird; pipe cleaners and other materials for building the nest and making it comfortable; and the parent facilitation guide.

Home Visits and Support

In between the parent workshops, Head Start teachers and family members incorporate conversations about the HSE program into their regular home visits and parent meetings. The goals of integrating HSE into the home visits and parent conferences are to (a) encourage families to continue to build interest in the activities and the engineering design process and (b) provide more support for parents outside the workshops.

During the 2017–18 school year home visits, staff members provided broad support tailored to the needs and interests of each family, such as answering family questions about the program, trying out the activities with the parents and children, offering suggestions for facilitating and expanding on the activities, modeling ways of using the engineering design process, and reminding families about upcoming program events and dates. The resource guide that Head Start teachers and family workers used as a tool during the home visits is attached in Appendix E.

Classroom Activities

Head Start teachers who participated in the project also brought several aspects of the kit activities into their classrooms, individually adapting the materials to their own teaching and curriculum goals. Teacher implementation ranged from reading one of the books to their students, to engaging them in the kit activities, to using the kits as a foundation for further exploration of materials and design challenges.

During the 2017–18 school year, the Head Start teachers provided a number of examples of how to adapt the family take-home activity kits to the classroom setting:

- *Fox and Hen*—Create larger and more elaborate towers and structures to protect the hen using the classroom blocks area.
- *Mouse Run*—Build longer, collaborative pathways for the mouse on the classroom wall.
- *Bubble Wands*—Experiment with the effectiveness of different bubble solution ingredients and ratios.
- *Bird Nest*—Look at example bird nests in pictures and in the neighborhood to inspire children's designs.

Science Center Field Trip

The culminating, end-of-year program event is the field trip to the local science center (Oregon Museum of Science and Industry). This event is an opportunity for families from the program to visit the science center, play with their children and relatives for two hours, celebrate the end of the program, and become familiar with the science center as a space to continue their exploration of science and engineering. The museum is closed to other visitors during the event, which helps build a sense of community among participants. Food is provided at the beginning of the event, and transportation is offered for those families and participants who need it.

RESEARCH AND EVALUATION

HSE is designed to be a research- and evidence-based program. The program model and activities have been developed iteratively since 2014 based on ongoing community and family input and findings from research and evaluation studies (Pattison & Dierking, 2018; Pattison et al., 2017, 2018b, 2018c; Svarovsky et al., 2017).

The strongest evidence of HSE's impact to date comes from the pilot study conducted during the 2017–18 school year with approximately 28 families and seven Head Start teachers and family workers (Pattison et al., 2018a). The team assessed program impacts through a pre- and post-program survey with parents and Head Start teachers, post-program interviews with parents, and monthly online journals with Head Start teachers.

Key findings for family participants:

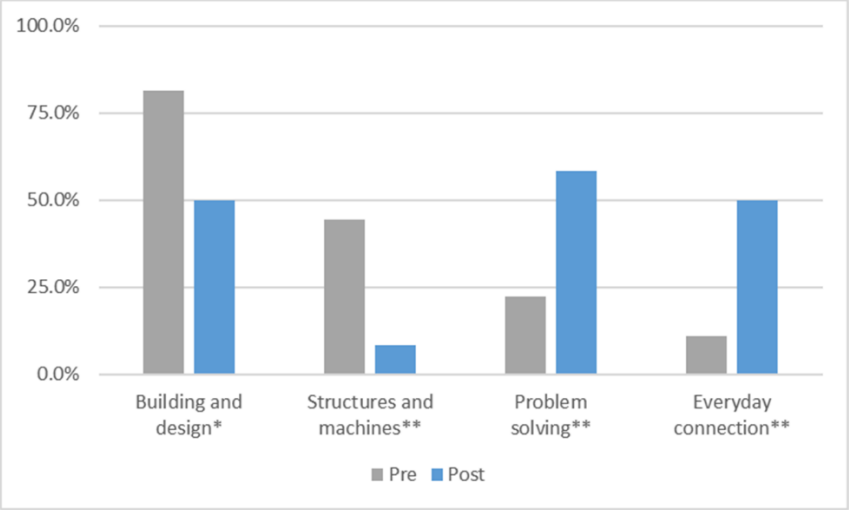
- Parent participants reported higher levels of personal interest in engineering and comfort supporting their children's engineering interests compared to responses in the pre-program survey. These changes were large and statistically significant (i.e., the differences are likely not due to chance and would probably generalize to a broader group of program participants). Parent value for engineering in early childhood was high at the outset and remained relatively stable.

> *Gracias al conocimiento de la ingeniería hemos estado aprendiendo mucho y saber que todos somos ingenieros desde los más chiquitos de las casa hasta los más grandes.*
> *(Thanks to the knowledge shared about engineering, we have been learning a lot—including how we are all engineers, from the youngest in the house to the oldest.)*
> – HSE parent

- Parent participants reported engaging with engineering-related activities with their children and families more frequently compared to responses in the pre-program survey. These changes were large and statistically significant. For example, parents reported talking with their children about engineering, finding examples of

engineering in everyday life, and using engineering skills when playing with their children between several times a month and several times a week on average at the end of the program.

- Parents reported regularly engaging with the HSE activities and materials with their children one month after the last parent workshop. For example, parents reported talking with their children about the program, using the activity kits, and reading the books between several times a month and several times a week on average.



Percentages represent number of coded response out of total valid responses.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. $n_{pre} = 27$, $n_{post} = 24$.

Figure 3. Parent associations with the word engineering

- Parents demonstrated expanded understandings of engineering and its relevance to everyday life compared to responses in the pre-program survey (see Figure 3). In the pre-program survey, parents often described engineering as related to building, design, structures, and machines. In the post-program survey, parents were much more likely to describe engineering as related to problem-solving in everyday contexts. Parents were also much more likely to see engineering as relevant to everyday activities. These differences were large and statistically significant.
- Every parent participant that completed the post-program survey indicated they would be likely or very likely to recommend the program to other Head Start families.

Key findings for Head Start staff:

- Head Start staff members reported higher levels of personal interest in engineering and confidence in engaging Head Start children and families in engineering compared to responses in the pre-program survey. These changes were large in magnitude. However, because of the small sample size the differences were not statistically significant. Value for engineering in early childhood was high at the outset and remained relatively stable, similar to parents.

> *I've really enjoyed being part of this program for another year. All the families have expressed gratitude for the program and have felt that they learned a lot from it. We all hope the program will continue to grow and offer support and amazing experiences for families in the future.*
> – Head Start teacher

- Head Start staff members increased the frequency that they engaged with engineering-related activities with children and families. This change was large and statistically significant. For example, during the last month of the school year teachers and family members reported talking to families about engineering, using the words "engineer" and "engineering" with children and parents, and incorporating the engineering design process into other activities between several times a month and several times a week on average.
- In discussing other ways that they felt engineering is valuable for Head Start families and children, staff members emphasized everyday problem-solving and ways of thinking (e.g., "Engineering can help families by teaching them to problem solve in creative ways—it gives them the power to create"), parents and children working together (e.g., "It helps them to work as a team"), and other domains of early childhood development (e.g., "It includes all academic skills in a wholistic and meaningful way").
- When asked about ways the program supported positive changes for families, common responses included: helping parents and children spend more time and learn together, helping families improve and

learn new approaches to problem-solving, providing new activity ideas for families, and learning more about engineering.

There are still many questions about how these impacts will generalize to a larger number of families and how they will be sustained over time as children enter kindergarten. More information about the evaluation of the 2017–18 school year pilot study can be found in the evaluation technical report, including copies of the English and Spanish surveys administered to parents and teachers (Pattison et al., 2018a).

FINAL THOUGHTS

As we noted at the beginning of this guide, *Head Start on Engineering* (HSE) is a work in progress. We continue to develop new materials, refine and improve the activities, and update the program model based on ongoing research and input from partners and families. Building on lessons learned from the 2017–18 school year, we are already focused on making a number of improvements that may be relevant to other organizations:

- ***Increasing workshop attendance***—Although they indicated that the evening workshops were a valuable part of the program, for variety of reasons parents were often not able to attend all of the workshops throughout the year. Advisors and participants offered a number of suggestions for supporting workshop attendance, including more frequent text message reminders, back-up workshop dates in case of weather cancellations, and holding workshops at sites that parents are familiar with rather than combining sites.
- ***Including parent-child interaction components in the parent workshops***—An important goal of the parent workshops is to provide parents time to engage with engineering themselves as learners before trying to support their children. This was indeed a valuable aspect of the program for participants. However, parents also requested time during the workshops to work directly with their children while program staff are present.
- ***Broadening the appeal and accessibility of the program***—Advisors and participants emphasized that the word engineering may be intimidating to many parents. They recommended improving the way the program is advertised to families and emphasizing problem-solving skills and fun activities for parents and children.

For those interested in adapting HSE for their own communities and organizations, we want to reiterate that the program is more than take-home engineering activities but rather an integrated set of experiences that creates ongoing support for children and families to engage with engineering in their homes, in the classroom, and across their lives. When

considering how HSE might be implemented, we recommend focusing on the following elements that we believe have been key to the program's success:

- ***Strong collaboration***—The four primary partner organizations have been working together for years and meet regularly to guide the direction of the project. Each brings unique and complementary expertise, including knowledge of early childhood development, family engagement, research and evaluation, engineering education, and informal learning.
- ***Authentic partnerships with community***—We take seriously the goal of working with families and community stakeholders to develop and implement the program and have created a number of structures for supporting this authentic partnership approach, including a consensus leadership model, partnerships between researchers and programmers, a Parent Advisory Council, and collaborative dissemination to local and national audiences.
- ***Holistic approach to early childhood education***—Beyond the Head Start classroom, the HSE model connects learning experiences across a variety of contexts, including the home, parent workshops, classroom activities, and science center visits. HSE is also family-focused and provides support for both children and parents.
- ***Culturally responsive and inclusive approaches***—All of the program sessions and materials are bilingual, Spanish and English, and have been developed based on the needs and interests of low-income Head Start families. We continually aspire to increase the cultural relevance of the program for the Head Start community.
- ***Engaging, hands-on approach to engineering***—The program centers on open-ended, hands-on, age-appropriate engineering activities for children and their parents and focuses on the engineering design process as a relevant and accessible way for families to engage with engineering at this age.
- ***Focus on interest development***—We believe that sparking and sustaining interests for preschool children and their families will not

only prepare them for school but will help them become lifelong, self-motivated learners.

- ***Research-based theory of action***—The HSE model and activities are based on current research in early childhood education, informal science learning, family engagement, and interest development.
- ***Ongoing cycles of evaluation and improvement***—The program is continuously revised and improved based on piloting, research and evaluation, and community input.

Over the coming years, HSE will continue to expand and improve. Currently, we are exploring funding opportunities for ongoing collaboration and program development, additional support for families as they transition into kindergarten, the creation of more culturally relevant activities and materials, exploration of how HSE might work in other program contexts, and other research to deepen our understanding of how young children their families develop long-term interests in engineering. Ultimately, we hope this work will not only contribute to the lives of families and organizations in our community, but also provide knowledge and a successful program model for educators across the country.

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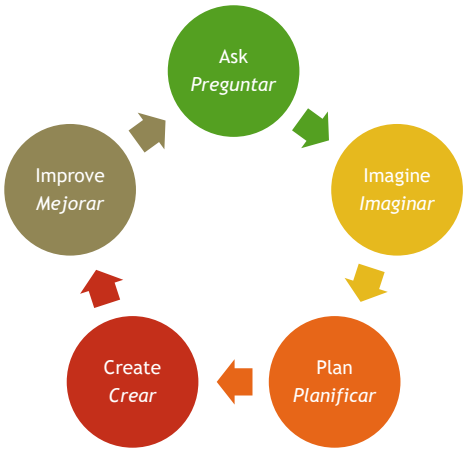
APPENDICES

APPENDIX A: Engineering Design Process Overview

HEAD START ON ENGINEERING

Engineering Design Process

Proceso de diseño de ingeniería



Ask—Ask questions to understand the problem and what you need to solve it.

Pregunta—*Haz preguntas para entender el problema y qué necesitas para resolverlo.*

Imagine—Brainstorm as many possible solutions and designs as you can.

Imagina—*Piensa en la mayor cantidad de soluciones y diseños que puedas.*

Plan—Pick a design and decide how you will use your materials.

Planifica—*Escoge un diseño y decide cómo usarás los materiales*

Create—Build and test your design to see how well it solves the problem.

Crea—*Construye y pon a prueba tu diseño para ver qué tan bien soluciona el problema.*

Improve—Make changes to your design based on what you learned.

Mejora—*Cambia tu diseño en base a lo que aprendiste.*

The **engineering design process** is a cycle that engineers follow to create and test solutions to a problem. We also use this process to solve problems every day, like figuring out a food recipe or building a book shelf. Talking about the engineering design process with your child and using the steps when you play together is a great way to get your child interested in engineering and help them develop problem solving skills.

*El **proceso de diseño de ingeniería** es un ciclo que los ingenieros siguen para experimentar y encontrar soluciones a un problema. Utilizamos este proceso para resolver problemas todos los días, desde preparar una receta de cocina, hasta armar un estante de libros para la habitación de los niños. Cuanto más comprendemos y hablamos acerca de este proceso, más probabilidades tienen nuestros niños de incorporar este proceso y su vocabulario en la resolución de problemas.*

Engineering design cycle adapted with permission from the *Engineering is Elementary* project, Museum of Science, Boston.

APPENDIX B: Professional Development Workshop Agendas

Head Start on Engineering Professional Development Session 1: Introduction to Engineering

Time	Activity
8:45 AM	Breakfast • Teachers complete pre-program surveys if needed
9:00 AM	Introduction to Head Start on Engineering • Overview of project
9:30 AM	Overview of the goals and agenda • Agenda • Connection to second professional development workshop session • Group norms • Brief participant introductions
9:45AM	Introduction to Technology • Technology in a Bag activity (https://www.eie.org/eie-curriculum/resources/technology-bag) • Returning teachers: Brainstorm other technologies that are an object, a system, or a process. What problem does each technology solve?
10:20 AM	Introduction to Engineering • Tower Power activity https://www.eie.org/eie-curriculum/resources/what-engineering-tower-power) • Returning teachers: Form separate groups and try to build towers that can hold extra weight
11:05 AM	Break
11:15 AM	Analysis of homemade objects • Discuss homemade artifacts and design process using example containers from home provided by workshop leaders (e.g., plastic water bottle, juice box, etc.) • Everyone engages in engineering! • Returners: Spread out amongst the different group for this activity.
11:45	Essential Tenets of Engineering • Engineering process hand out
11:55	Compare and Contrast: Scientific Inquiry and Engineering Design • Similarity and differences between Science and Engineering • Inquiry and Design • Similar practices, different goals
12:15 PM	Lunch
1:00 PM	Welcome Back! Intro to the afternoon • HSE as a project has developed several activities • Today we will explore two of them

	• Each activity has a kit (review components)
1:20 PM	Explore HSE Activity #1 (Fox and Hen) • Split into groups. • Imagine you are doing this at home with your own family (your child/a niece/nephew/a neighbor's kid/etc. • Engage in the exploration of the activity with this in mind
1:40 PM	Unpacking activity • Reflect on your exploration • Intended for families and kids • How might you consider using this in the classroom?
2:00 PM	Explore HSE Activity #1 (Mouse Run) • Split into groups. • Imagine you are doing this at home with your own family (your child/a niece/nephew/a neighbor's kid/etc. • Engage in the exploration of the activity with this in mind
2:20 PM	Unpacking activity • Reflect on your exploration • Intended for families and kids • How might you consider using this in the classroom?
2:35 PM	Break
2:45 PM	Challenge: Develop your own activities! • We will engage in the design process! • Three options: Extend Fox and Hen, Extend Mouse Run, or Use a Familiar Story to generate a new design challenge • Every location to come up with at least one. More ideas are ok too! • Questions? (ASK)
2:55 PM	IMAGINE: Brainstorm • Individually on post its • Bring ideas together • Decide on which ones might make the most sense
3:05 PM	PLAN: Sketch out what you might do • Description of activity • What the kids will do • What you will do as the teacher • What other content standards are you meeting by doing this activity in class?
3:30 PM	Brief Share Out of Progress on Activities
3:40 PM	Wrap up • Share more about HSE, • Preview next session, • Exit Ticket: What is one thing you'll take away from today? What is one question that you still have?

Head Start on Engineering Professional Development
Session 2: Facilitating Engineering Design Activities

Day/Time	Activity
9:00AM	Welcome Back! Overview of the day: • Facilitation is essential to catalyzing learning • But before you can facilitate, you have to have a deeper understanding of engineering practices, so you can pick up on cues from children and guide them • We'll spend part of the morning focusing on three elements of engineering to get deeper understanding, then we'll try using these ideas to guide facilitation later. We'll first think about facilitation for children in our classrooms, then we'll talk about transferring this to supporting parents and families. • Reminder about when teachers will get copies of the activity kits • Gina joining us via Zoom • Extra time for breakfast and saying hello
9:20 AM	Reflections on Homework • Let's hear from each team. What did you do/think about? What are potential next steps? • Transition: deeper understanding is needed
9:30AM	Examining an Engineered Product: a Water Bottle • Adapt this activity from EiE's Plant Packages unit • What is the technology here? • What problem is it solving? • Who is the targeted consumer?
9:40AM	Package Analysis, in groups • Handout with questions (or slide) • Report out
10:00AM	Problem Scoping ("ask"): Understanding the Problem and User-centered Design • Introduce Featherstone Farms Plant Package shipping problem • Focus on problem scoping: what questions would you ask, and why? • [Better understanding your constraints] • [Understanding the needs of the client] • [Alignment of design to solving a specific problem]
10:20AM	Idea Generation ("imagine"): Building on Connections • Structured brainstorm using timer [2 min individual, 5 min together, 5 min with questions on slide] • Reflect on how ideas changed over time; how did design ideas improve?
10:35AM	Iteration and Optimization ("improve"): Re-designing in Response to Feedback and Balancing Constraints/Tradeoffs • Groups are given different prototyping results (handout or index card) • How would you revise your design? • How would you balance the tradeoffs? (i.e., budget?) • Closing discussion (5 min)

10:55AM	Stretch break!
11:00AM	Asking good questions to facilitate engineering design • Watch EiE videos (http://blog.eie.org/eie-teacher-tip-how-to-ask-good-questions) 8 minutes long • Group discussion (start with 1 minute of individual writing): What are key ideas about asking good questions to facilitate the engineering design process that you got from this video and that we should all remember? • Group discussion: This video was made for elementary school teachers. From you experience, what do we need to keep in mind when asking questions with preschool children? • Scott takes notes on white board/PPT
11:30 PM	Lunch

12:15 PM	Question Prompts for Fox and Hen and Mouse Run
	• Think back to the activities from last time.
	• If you wanted to engage a child more deeply in one of these areas of engineering design, what types of questions would you ask them? Write down at least 3 questions per area of engineering design.
	• Fox and Hen activity
	  ○ Reminder of activity context, story, goal
	  ○ Discussions in pairs/trios
	  ○ Brief group check-in before moving to next activity
	• Mouse Run activity
	  ○ Reminder of activity context, story, goal
	  ○ Discussions in pairs/trios
	• Group discussion: Common themes across the two activities?

1:15 PM	Supporting Parents and Families
	• This morning: deeper dive into engineering so you could facilitate in your classrooms.
	• Now: how do we facilitate families doing this work?
	• Group discussion: What do we need to keep in mind when helping parents facilitate these activities? (E.g., support, respect, empowering parents to take the lead)
	• Watch GRADIENT clip one (mother and child)
	  ○ Imagine this was one of the families you were working with at you Head Start location!
	  ○ Group discussion (a few minutes to share with a partner, then group discussion): What are some things that went well in this interaction, in terms of the engineering design process and the parent's facilitation? What are some additional approaches and tools we could help the parent with?
	• Watch GRADIENT clip two (father and child)
	  ○ Group discussion: (same as above)
	• Wrap-up discussion (a few minutes individually, then sharing): What are some things you would like to focus on with parents this year as we introduce the HSE activities and the engineering design process?

2:00 PM	Workshopping HSE activity #3 – Bubble Wands • Introduction from Veronika • Introduce context, design challenge, and materials

	• Clearly state the design goal of this activity
	• In small groups: participants to explore the activity and review the facilitation guide in small groups (10 minutes).
	• Now, it's your turn to use everything you've learned and make this a better activity for supporting family engagement in the engineering design process!
	  ○ In small groups: participants identity at least three improvements to the activity design, materials, or facilitation guide (20 minutes).
	  ○ What are different imaginative contexts that might work for this activity and help encourage engineering design?
	  ○ What are different ways to frame the challenges for families?
	  ○ What are ways to help encourage families to imagine and plan before they start creating?
	  ○ What are ways to help encourage families to iterate and improve on their designs?
	  ○ Group share-out (each group briefly presents)

2:45 PM	More information about the project • Review of next steps and implementation schedule (reminder about family engineering nights, monthly professional development meetings, evaluations and journals, etc.) • Check-in about teacher and staff roles during engineering nights and parent workshops • Questions or ideas?
3:15 PM	Wrap-up and Evaluations Check-in with location-specific contacts • Debrief about "homework" process at each location • Review of next steps and future meetings • Coordinating program planning meeting in December • Questions or ideas?
3:25 PM	Check-in with location-specific contacts • Debrief about "homework" process at each location • Review of next steps and future meetings • Coordinating program planning meeting in December • Questions or ideas?

APPENDIX C: Parent Workshop Agendas

Parent Workshop #1 Agenda

Head Start and Engineering

Time	Activity
6:30 PM	**Welcome and dinner** • Share workshop agenda and logistics
6:45 PM	**Introductions** • *To get to know each other, share your name, one thing you are very interested in, and how you got interested in it.* • Debrief about how interests develop at a young age and shape what we do in our lives--e.g., *In most of these examples, your interests started when you were young and they were supported by family members. That's why your role as parents is so important, especially at this age!*
6:55 PM	**Overview of HSE project** • Overview of program goals and components
7:00 PM	**Introduction to engineering design process** • Engineering is Elementary index card activity (https://www.eie.org/eie-curriculum/resources/what-engineering-tower-power) • Group debrief about activity, introducing the engineering design cycle • Quick pair-and-share activity: *What are ways you think you've used this process before, in work or in your everyday life?* • Key messages for this segment: *Engineering is everywhere. We are all engineers. Having fun is important. The process is an ongoing cycle. Each step is important. Each design was different. There are different solutions to the same problem. You can help your kids by using the word engineering and helping them with the engineering design process.*
7:30 PM	**The Fox and Hen activity** • Introduction to Fox and Hen activity kit, showing the different components • Review of Fox and Hen activity video (https://vimeo.com/256122624) and discussion about activity goals and facilitation strategies.
7:50	**Wrap-up** • Workshop wrap-up, questions, reminders, thank you to participants • Homework for next workshop: *Think about something that you've built or designed yourself and how you used the engineering design process, if at all—be ready to share at the next meeting!*

Parent Workshop #2 Agenda

Head Start and Engineering

Time	Activity
6:30 PM	**Welcome and dinner** • Share workshop agenda and logistics
6:45 PM	**Introductions** • Welcome new families and returning families
6:50 PM	**Revisit last session** • During last session we: Talked about connections between our lives and the engineering design cycle. reviewed the engineering design cycle, discussed the video
7:00 PM	**Family sharing about home activities** • *Did you use the kit at home? How did it go? Did you discover something by doing the activity? How did you use the book? Did you add any materials to the activity? Did other challenges other than the proposed?* • Teachers share of classroom activities
7:15 PM	**Homework Discussion** • Ask parents to share something they created/made. Ask them to share among themselves (by table/group) • After 5 minutes open to big group discussion • Use the engineering design challenge on the wall to refer to specific designs as they share • Key messages: *The engineering design process exists and happens throughout our daily routines. Iteration and having a clear challenge/desired outcome are key to the process. Everything around us involves a process of iteration to keep improving and making our lives better*
7:30 PM	**Mouse Run activity** • Introduction to Mouse Run activity (https://vimeo.com/257000695) • Watch the video introduction, storytelling, and challenge one segments • Parents try to the activity out (challenge one) • Debrief: *What questions do you have about the activity materials and goals? What question or ideas do you have about facilitating the activity?*
7:55	**Wrap-up** • Workshop wrap-up, questions, reminders, thank you to participants • Homework: *Watch the entire video and think more about parent facilitation and role of the book.*

Parent Workshop #3 Agenda

Head Start and Engineering

Time	Activity
6:30 PM	**Welcome and dinner and icebreaker** • Share workshop agenda and logistics • Icebreaker: Ask families to explore other example children's books and think of engineering design challenges they could do based on those stories
6:45 PM	**Introductions—Welcome new families and returning families** • Welcome new families and returning families
6:50 PM	**Revisit last session (quick recap)** • During last session we: Talked about how we used the Fox and the Hen kit at home, reviewed the engineering design cycle and shared examples from our own lives, introduced the Mouse Run activity and watched the video
6:55 PM	**Family sharing about home activities** • *Did you use the kit at home? How did it go? Did you discover something by doing the activity? How did you use the book? Did you add any materials to the activity? Did invent new challenges?* • Teachers share of classroom activities

7:10 PM	**Bird Nest and Bubble Wand Rotation**
	• Brief introduction to Bird Nest and Bubble Wand activities in large group
	• Table rotation (10 minutes each, with 5 minutes for group debrief at end)
	  ○ Table 1: Bird Nest challenges 1 and 2
	  ○ Table 2: Bubble Wand activity challenges 1 and 2
	• Group debrief: *What questions do you have about the activity materials and goals? What question or ideas do you have about facilitating the activity?*

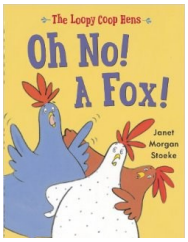
7:40 PM	**Final debrief** • *What was the most important thing/message you learned during the workshops?* • *We are planning more sessions in the future, what would you encourage us to keep as part of the experience? Any other recommendations to make the workshops better?* • *After this program, what can you do to keep you and your child interested and curios about learning? About the engineering design process?*
7:55 PM	**Wrap-up** • Hand out (and quickly describe) family resource sheet • Thank you to participants and final reminders

The Fox & The Hen

Practice engineering with your child by protecting a hen from a fox.

Parents/Caregivers:

- Let your child spend as much or as little time on each step as he or she desires.
- Have fun with your child through each step of the design and engineering process.



Step #1: Read and talk about the story!

- How do hens and foxes feel about each other?
- What would you do to keep a hen safe from a fox?

Step #2: Build!

Using the foam blocks, build a structure so the hen can protect her eggs from the fox. What do you think the hen would like? It has to be taller than the fox!

Step #3: Twice as tall!

What if the fox was twice as tall? What if the fox got stronger and can now jump twice as high? Build a structure twice the size of the fox!

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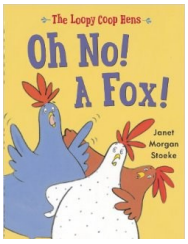
El zorro y la gallina

Practica la ingeniería con tu hijo o hija.
Protege a una gallina de un zorro.

Padres y apoderados:

•Deja que tu hijo o hija pase todo el tiempo que quiera en cada paso.

•Diviértete con tu hijo o hija en cada paso del proceso de diseño e ingeniería.



Paso #1: Lean el cuento y conversen sobre él

•¿Cómo se llevan las gallinas y los zorros?
•¿Qué harías para proteger a una gallina de un zorro?

Paso #2: ¡A construir!

Utilizando los bloques de goma, construye una estructura para que la gallina pueda proteger a su huevos del zorro. ¿Qué crees que le gustaría a la gallina? ¡Construye algo más alto que el zorro!

Paso #3: ¡El doble de alto!

¿Qué harías si el zorro fuera el doble de alto? ¿Qué pasaría si el zorro fortalece y puede saltar más arriba? ¡Construye algo el doble de alto que el zorro!

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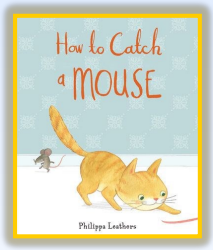
Mouse Run

Practice engineering with your child by using tubes to create a path for a "mouse."

- Have fun with your child through each step of the design and engineering process.
  - Spend as much or as little time on each step as your child desires.
  - Find other creative ways to practice engineering with this activity.

1 Read and talk about the story



- What do you think the cat wants to do?
- What would you do to protect the mouse from Clemmie?

2 First challenge: **Help the mouse escape!**

Stick the images on the board. Using the materials provided, create a path on the board so the mouse can roll from the cat to the mice family. How many different materials can you use? If the ball gets stuck, how do you have to change your design?

3 Second challenge: **Feed the mouse!**

On the same board, create a path so the mouse can roll from the cat to at least one food item before reaching the mice family. What type of pattern do you have to create to achieve this goal? How can you make the mouse go faster or slower? What other materials can you use for this activity?

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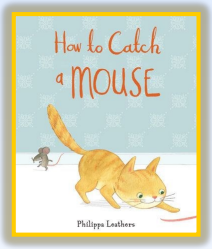
Practica la ingeniería con tu hijo o hija. Usa los tubos y crea un camino para el "ratón".

¡Corre, ratón!

- Diviértete con tu hijo o hija en cada paso del proceso de diseño e ingeniería.
- Pasa todo el tiempo que sea necesario en cada paso.
- Descubre otras maneras de practicar la ingeniería con esta actividad.

1 Lean el cuento y conversen sobre él



- ¿Qué crees que quiere hacer el gato?
- ¿Qué harías para proteger al ratón de Clemmie?

2 Primer desafío: **¡Ayuda al ratón a escapar!**

Pega las imágenes sobre el tablero. Utilizando los materiales, crea un camino para que el ratón se deslice desde el gato hasta la familia de ratoncitos. ¿Cuántos materiales distintos puedes usar? Si la pelota se queda pegada, ¿cómo tienes que modificar tu diseño para que siga avanzando?

3 Segundo desafío: **¡Alimenta al ratón!**

Sobre el mismo tablero, crea un nuevo camino para que el ratón pueda pasar por al menos un alimento antes de llegar donde el resto de los ratoncitos. ¿Qué tipo de diseño tienes que crear para lograrlo? ¿Qué puedes hacer para que el ratón avance más rápido o más lento? ¿Qué otros materiales puedes utilizar para esta actividad?

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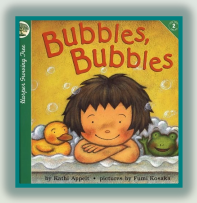
Bubbles

Engineer bubble wands for your child to use in the bathtub!

1 Read and talk about the story



- What toys do you like for the bath?
- What do you usually use to blow bubbles?

2 First challenge: **Make a bubble wand!**

Use <u>just</u> pipe cleaners to make bubble wands in the bathtub. What different designs can you make? When you are playing with bubbles, how do you get bigger bubbles?

3 Second challenge: **Make a bath toy!**

Use <u>other</u> materials to create bubble wands in the bathtub! How can you combine all the bubble wands you made to create a bath toy?

- Have **FUN** with your child through each step of the design and engineering process!
- Spend as much or as little time on each step as your child desires.

The bubble soap provided is safe for the bath!

For playing outside of bath time, you can use dish soap and water.

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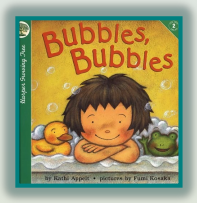
Burbujas

Practica la ingeniería con tu hijo o hija. ¡Crea varillas de burbujas para usar en la tina!

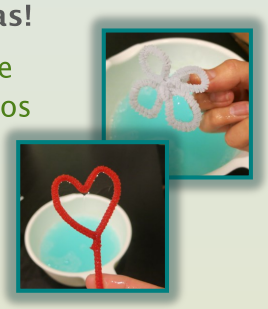


1 Lean el cuento y conversen sobre él

- ¿Qué juguetes te gusta usar en la tina?
- ¿Qué usas para hacer burbujas?

2 Primer desafío: **¡Crea una varilla de burbujas!**

Usa solo los limpiapipas para crear varillas de burbujas cuando estés en la tina. ¿Qué diseños distintos puedes crear? Cuando haces burbujas, ¿qué puedes hacer para que salgan más grandes?



3 Segundo desafío: **¡Crea un juguete para la tina!**

Usa los otros materiales para crear varillas de burbujas cuando estés en la tina. ¿Cómo puedes unir todas las varillas que creaste en un solo juguete que puedas usar en la tina?

- **¡DIVIÉRTETE** con tu hijo o hija en cada paso del proceso de diseño e ingeniería!
- Pasa todo el tiempo que sea necesario en cada paso.

El jabón de burbujas incluido es seguro para bañarse.

Para jugar con burbujas fuera de la hora de tina, mezcla detergente líquido con agua.

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Practice engineering with your child by creating a nest for a bird.

Bird's Nest

- Have fun with your child through each step of the design and engineering process.
  - Spend as much or as little time on each step as your child desires.
  - Find other creative ways to practice engineering with this activity!

1 Read and talk about the story

- Where do birds usually build their nests?
- What materials do they use?

2 First challenge: Design a nest on top of a bowl

Using the materials, build a nest that can rest on top of the bowl without falling in. Does the bird fit entirely inside the nest?

- How can you make the nest safer?

3 Second challenge: Design a nest on top of a cup

Now that the nest has been tested once, you need to modify your design so it can balance and rest on top of the small cup. Make sure the bird still fits entirely inside the nest, and that it provides comfort for the sleepy bird.

- How can you design a bigger nest to hold more birds?
- What makes your nest comfortable?

Head Start on Engineering is a collaboration between the Institute for Learning Innovation, Mt. Hood Community College Head Start, Oregon Museum of Science and Industry (OMSI), and University of Notre Dame. The program is funded in part by the National Science Foundation, Oregon Community Foundation, Collins Foundation, Boeing Corporation, University of Notre Dame, and Juan Young Trust.

Practica la ingeniería con tu hijo o hija creando un nido para un pájaro.

Nido de pájaro

- Diviértete con tu hijo o hija en cada paso del proceso de diseño e ingeniería.
- Pasa todo el tiempo que sea necesario en cada paso.
- Descubre otras maneras de practicar la ingeniería con esta actividad.

1 Lean el cuento y conversen sobre él

- ¿En qué lugares construyen nidos los pájaros?
- ¿Qué materiales utilizan?

2 Primer desafío: Diseña un nido sobre un recipiente

Utilizando los materiales, construye un nido que repose sobre el recipiente sin caerse adentro de él. ¿El pajarito cabe adentro del nido? ¿Cómo puedes hacer que el nido sea aún más seguro?

3 Segundo desafío: Diseña un nido sobre un vaso

Ahora que creaste tu nido, modifica tu diseño para que el nido pueda reposar sobre el vaso sin caerse. Asegúrate que el pajarito pueda caber por completo adentro del nido, y que sea un lugar cómodo para dormir.

- ¿Cómo puedes diseñar un nido más grande donde quepan más pájaros?
- ¿Qué cosas le brindan comodidad al nido?

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APPENDIX E: Family Engineering Interest Handout

SUPPORTING YOUR CHILD'S INTEREST IN ENGINEERING

Below are some ways you can encourage your child's interests in engineering, even after the Head Start on Engineering *project ends. And remember, as a parent or caregiver, you know your child best—trust your instincts and find ways to support your child's learning and development that work for your family.*

Show your own excitement and interest

What you are interested in and passionate about as a parent or caregiver has a big influence on your child. So share your interests, learn more about engineering yourself, and stay involved and excited when the two of you do an engineering activity together. You can also find ways to connect engineering, design, and problem solving with your own interests, such as:

- Cooking and gardening
- Arts and crafts
- Building and construction
- Puzzles and games

Talk about engineering with your child

Try to make engineering a regular part of your conversations. Here are a few things you can say:

- *You just solved that problem in a very creative way. You're an engineer!*
- *We're going to need to do some engineering to solve this problem. What are three different ideas we can try?*
- *Remember what engineers do—if it doesn't work the first time, let's change our design and try again.*
- *How do you think we could improve our design so that it works even better?*

Look for new opportunities to support your child's interests

One of the most important roles for parents and caregivers is providing new resources and opportunities as your child's needs and interests change, including things you can do every day:

- Use materials around the house to create a new engineering challenge or activity.
- Let your child help you with a chore that involves problem solving and engineering, like cooking or repairing something in the house.
- Ask your child to share their ideas and input when doing creative, design activities.

Find opportunities and resources in your community

- Use the local library to learn more about engineering or find books that inspire new engineering activities (e.g., *Rosie Revere, Engineer*, *Not a Box*, or *Iggy Peck, Architect*).
- Visit OMSI or the Portland Children's Museum with your family.
- Sign your child up for a class at the library (https://multcolib.org/events/steam), OMSI (http://www.omsi.edu/camps-and-classes),[1] the YMCA (http://ymcacw.org/summer-camps), or the Art of STEM (http://www.artofstem.com/camps.html).

[1] Apply for financial aid for OMSI camps and classes here: http://www.omsi.edu/camps-classes-financial-aid.

APOYANDO EL INTERÉS DE SUS NIÑOS EN LA INGENIERÍA

A continuación, se presentan algunas maneras en las que puede fomentar el interés de su niño en la ingeniería, incluso después de que finalice el proyecto Head Start on Engineering. *Y recuerde, como padre o cuidador usted conoce mejor que nadie a su niño, confíe en sus instintos y escoja las herramientas y formas que funcionen para usted y su familia.*

Muestre su interés y entusiasmo

Lo que le interesa y apasiona como padre o cuidador tiene una gran influencia en su hijo. Así que comparta sus intereses, aprenda más acerca de la ingeniería y manténgase involucrado cuando los dos estén haciendo una actividad de ingeniería juntos. También puede encontrar maneras de conectar la ingeniería, el diseño y la resolución de problemas con sus propios intereses, tales como:

- La cocina y la jardinería
- Arte y manualidades
- Construcción
- Juegos y rompecabezas

Hable de ingeniería con su niño

Intente que la ingeniería sea una parte normal de sus conversaciones. Aquí sugerimos algunas cosas que puede decir:

- *Acabas de resolver ese problema de una manera muy creativa. ¡Eres un ingeniero!*
- *Vamos a necesitar ingeniería para resolver este problema. ¿Cuáles son tres ideas diferentes que podemos probar?*
- *Recuerda lo que hacen los ingenieros, si no funciona la primera vez, cambiemos nuestro diseño y vuelve a intentarlo.*
- *¿Cómo crees que podríamos mejorar nuestro diseño para que funcione aún mejor?*

Busca oportunidades para apoyar los intereses de tu niño

Una de las funciones más importantes de los padres y cuidadores es proporcionar nuevos recursos y oportunidades conforme cambian las necesidades e intereses de su niño, incluyendo cosas que puede hacer todos los días:

- Use materiales que tenga en casa para crear un nuevo desafío o actividad de ingeniería.
- Deje que su hijo le ayude con una tarea que involucre solución de problemas e ingeniería, como cocinar o reparar algo en la casa.
- Pídale a su niño que comparta sus ideas cuando hagan actividades creativas y de diseño.

Encuentre recursos y oportunidades en la comunidad

- Utilice la biblioteca local para aprender más acerca de la ingeniería o para encontrar libros que inspiren nuevas actividades de ingeniería (por ejemplo, *Rosie Revere, Engineer*, *Not a Box* o *Iggy Peck, Architect*).
- Visite OMSI o Portland Children's Museum con su familia.
- Inscriba a su hijo en una clase en la biblioteca (https://multcolib.org/events/steam), OMSI (http://www.omsi.edu/camps-and-classes),[2] YMCA (http: /ymcacw.org/summer-camps), o The ART of STEM (http://www.artofstem.com/camps.html).

[2] Para solicitar ayuda financiera para los campamentos y clases de OMSI, visite este link: http://www.omsi.edu/camps-classes-financial-aid.