Family Involvement in Science

Literacy-Infused Science Learning Engages Families in Science Dialogue and Builds Communication Skills and Vocabulary

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Family Involvement in Science (FIS)© was a key innovation of Project **V**irtually-**I**nfused **C**ollaborations for **T**eaching and Learning **O**pportunities for **R**ural **Y**outh: Implementation and Evaluation of Online and Face-to-Face Delivery in High-Needs Schools (VICTORY, Grant Award No. S411B200055), a federally funded science education project for Texas rural schools. FIS was designed to provide students and their families with hands-on, interactive science learning activities to complete at home, fostering both family engagement and scientific literacy. In this research brief, we detail what is included in FIS and explore parent/family member perceptions of the take-home science activity kits.

What is FIS?

FIS was developed for third- through fifth-grade students and their families, with a particular focus on students in rural areas. These areas often have limited access to informal science learning opportunities, making programs like FIS essential for fostering curiosity and learning beyond the classroom setting. FIS served dual purposes. First, it was designed to build student language and literacy skills, including academic science vocabulary, through science dialogue with family, and second, FIS enhanced students' access to, and engagement with, science. The curriculum infused literacy based on the science of reading, and the lesson content in the booklets aligned with the Texas Essential Knowledge and Skills (TEKS) standards. The booklets focused on essential earth science concepts, such as weather and climate, the water cycle, and the formation of sedimentary rocks. One FIS kit was sent home each week.

Each eight-page FIS booklet contains the following sections: (a) a welcome letter and introduction to the science topic, (b) fun facts on the topic, (c) vocabulary words and student-friendly definitions, (d) a reading passage and comprehension questions, (e) a diagram or graph activity, (f) a hands-on science experiment, and (g) extension activities. FIS booklets are carefully structured to support engaging, family science learning experiences through a variety of literacy-infused science activities and hands-on resources. The booklets are available in Spanish and English.

Figure 1

Sample FIS Booklets

What's Inside

The FIS kit is enclosed in a drawstring backpack. The hands-on science experiments mainly utilize items commonly found in the home (e.g., an ice cube, a rubber band, etc.); if a special item was required for the experiment, the project would supply it. Additionally, the kits contain a pre-loaded Android tablet with a microSD card to enhance the learning experience. To capture the collaborative interactions between students and their family members during FIS activities, participants are encouraged to use the tablets to record. Clear, step-by-step instructions are included in the kit. To further support family engagement, the kits also featured a spiral-bound family resource guide. This guide offers straightforward instructions on using the tablet to document interactions.

Parent/Family Member Perceptions of FIS

The research team designed a short survey to gather feedback from families about their experiences with the FIS activities. The survey, also available in English and Spanish, asked about family members' experiences, attitudes, and levels of engagement with the activities. After completing the FIS activities, families were instructed to fill out the paper survey and return it to the science teacher. The FIS survey included eight statements on a five-point Likert scale (Table 1), ranging from "strongly disagree" (1) to "strongly agree" (5). The survey also included one multiple-choice and two open-ended questions.

Table 1

Questions in the FIS Survey

Survey Items	Questions
Item 1	It was fun to do science activities with my 5th grade child.
Item 2	This has encouraged us to have more science conversations at home.
Item 3	We did the extension activities on the back of the booklet.
Item 4	My 5th grade child's attitude toward science improved with the use of the FIS booklets.
Item 5	The instructions for the science activity were easy to follow.
Item 6	The assigned activities didn't take too long.
Item 7	It was easy to use the science vocabulary during the activities.
Item 8	I could easily find the materials needed to complete the activities.

Results of the Grade 5 FIS Survey

In the third year of Project VICTORY, we distributed eight FIS kits to fifth-grade students and their families in rural Texas. To track trends and growth over time, we administered two identical FIS surveys at two different time points (FIS survey #1 and #2) to the families. We received 163 responses to survey #1 and 140 responses to survey #2. To find the number of students/families who filled out both surveys, we needed to identify the common participants across both surveys. One-hundred and six families completed both surveys. The next step would be to focus on the responses from these 106 families and analyze their data across the two time points.

Quantitative Results

Table 2 presents the mean score for each Likert-scale item across the two surveys.

Overall, the responses indicated a high level of agreement on the survey questions, with mean scores ranging from 3.28 to 4.42. Item 1 consistently received the highest ratings, with a increase from 4.40 in survey #1 to 4.42 in survey #2, suggesting that families experienced more fun over time while engaging in FIS activities with their children. Ratings on Item 2 increased from 3.86 in survey #1 to 3.94 in survey #2, indicating that families increased their discussion of science topics at home. Ratings on Item 3 increased from 3.28 in survey #1 to 3.41 in survey #2; this suggested that families engaged in more extension FIS activities over time. For Item 4, the ratings also rose from 3.93 in survey #1 to 3.97 in survey #2. Families perceived a positive shift in their children's attitudes toward science when engaging with FIS activities.

Table 2

Mean Scores for Each Likert-scale Item Across Two FIS Surveys (N=106)

Item	FIS survey #1	FIS survey #2
Item 1	4.40	4.42
Item 2	3.86	3.94
Item 3	3.28	3.41
Item 4	3.93	3.97
Item 5	4.30	4.30
Item 6	4.16	4.13
Item 7	4.23	4.27
Item 8	4.34	4.29

The ratings on Item 5 stayed steady and high at 4.30 across both surveys, suggesting that families continued to find the instructions clear and easy to follow over time. Ratings for Item 6 showed a slight decrease from 4.16 in survey #1 to 4.13 in survey #2. It may be that families felt the FIS activities were taking a bit longer to complete. In the future, we may consider adjustments to ensure the activities remain manageable in duration. Ratings on Item 7 increased from 4.23 in survey #1 to 4.27 in survey #2. Over time, families found it easier to use the science vocabulary and student-friendly definitions in the FIS booklets and felt comfortable referring to them during activities. Ratings on Item 8 decreased slightly from 4.34 in survey #1 to 4.29 in survey #2, but remained high compared to other items. Families consistently found it easy to locate household materials to complete the FIS activities. While the project provided the necessary hands-on materials, families were encouraged to use common household items, such as water, ice, bottles, or cups, to complete the activities.

Qualitative Results

The FIS survey also asked families to reflect on their overall experience through two open-ended questions: (a) Did you feel comfortable doing the FIS activities at home? Why or why not?, and (b) Is there anything else you would like to share about your experience with the FIS booklets?

After analyzing the qualitative responses from 106 families, the following themes emerged:

1. FIS activities are interesting, enjoyable, and fun to do. Several families mentioned that the activities were engaging and provided an enjoyable experience for both parents and children.

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1. FIS activities are interesting, enjoyable, and fun to do. Several families mentioned that the activities were engaging and provided an enjoyable experience for both parents and children. Representative quotes follow:

- "Sí, es muy interesante hacerlo juntos. *(Yes, it is very interesting to do it together.)*"
- "Sí, porque fue divertido aprender mas de ciencia en casa. *(Yes, because it was fun to learn more about science at home.)*"
- "Sí, porque nos divertimos juntas. *(Yes, because we have fun together.)*"
- "Safe and exciting fun environment"
- "Yes, it was super easy to do and enjoyable"
- "Yes, it was a fun learning."
- "Yes, because it was a fun family activity."

2. FIS activities provide opportunities for families to work together, spend time together, and involve all family members. Many families expressed that the FIS activities allowed them to collaborate, connect, and involve everyone at home in the learning process. These activities served as a bonding experience. Following are representative quotes:

- "Yes, it allowed the whole family to get involved in the environment of our own home."
- "Yes - because I spent time with my son."
- "Yes, because everyone was able to be involved."
- "It is a very good project to spend time with the family."
- "Podimos conuiuiren familia aprendendo. *(We were able to join the family learning.)*"

3. FIS activities are guided, easy to understand, easy to follow, and easy to do at home. Families highlighted how the FIS activities were straightforward, well-structured, and manageable to complete at home. They appreciated the clear instructions and the simplicity of the tasks, which made the activities accessible for all family members. Representative quotes follow:

- "Todo es muy sencillo y fácil de entender para padres y hermanos. *(Everything is very simple and easy to understanding for parents and siblings.)"*
- "Yes, it was easy to follow."
- "Yes, it is guided."
- "Yes, instructions were easy to follow and complete."
- "Yes. They were easy to complete."

4. FIS activities enable families to learn more new things and engage in science talk. Families expressed that the FIS activities provided them with new learning experiences and sparked meaningful conversations about science. They appreciated the opportunity to explore scientific concepts together and discuss what they had learned. Following are several representative quotes:

- "Sí porque aprendimos cosas nuevas. *(Yes, because we learned new things.)"*
- "Yes, I [had] my child always talk about science."
- "Les ayuda aprender. *(It helps them to learn.)"*

5. FIS activities are comfortable for families to do at home in their own time with flexibility. Families appreciated the flexibility and convenience of completing the FIS activities at home, at their own pace, and when it was most convenient for them. This allowed them to balance other responsibilities while still engaging in meaningful learning experiences. Several quotes follow:

- "Yes, able to do it at home on his time"
- "Sí, porque pudimos hacerla cuando tuvimos temipo. (Yes, because we could do it whenever we wanted.)"
- "Yes, comfort of own home."

Conclusion

The findings from the FIS surveys have several important implications for future iterations of the FIS activities. Overall, families responded positively, indicating that the activities are generally effective and enjoyable. The instructions were easy to follow and understand, and the FIS activities provided opportunities for hands-on science learning, fostered more science-related conversations at home, and allowed families to engage in meaningful learning experiences together. However, the slight decline in scores for Item #6 suggested a need for ongoing refinement of the booklets. Although the activities were engaging and fun, some families felt they took too much time to complete. In the future, the activities could be restructured to be more time-efficient while still maintaining engagement and capturing children's attention throughout.

The qualitative responses complemented these findings, shedding light on specific aspects that made the FIS activities enjoyable and impactful. Families appreciated the opportunity to work together and spend quality time while engaging in science learning. Many emphasized the fun, hands-on nature of the activities, which allowed them to learn new things in an accessible and flexible way. The ease of understanding and the guidance provided in the activities were also noted as key factors that made the experience enjoyable and manageable for families of varying schedules.

Implications for Policy and Practice

These findings underscore the importance of integrating family engagement initiatives into broader STEM education policy, particularly in rural or underserved communities where access to informal learning opportunities may be limited. Policymakers and practitioners should consider incorporating take-home, literacy-infused science activities as part of family engagement frameworks in schools. In practice, future implementations may provide flexible formats (e.g., shorter activities, digital versions) to accommodate differing family schedules and needs while sustaining the benefits of collaborative, hands-on learning. By aligning such efforts with district- and state-level goals for science and literacy development, FIS programs can play a meaningful role in advancing high-quality science learning experiences for all families and their children.