# Family Learning and Sense-Making in Astronomy: Talk during Galaxies Workshops held in Four Rural Libraries

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**Abstract:** Families sense-making talk is a key component of engagement and learning of science in informal learning spaces. Using a multiple case study approach, 10 families' interactions (10 hours of video) were examined across workshops held at four rural libraries to determine how families talked about the science and if discussion prompts, which were provided as part of the workshop structure, helped or hindered the families conversations during a galaxy sort activity with images from telescopes.

As part of a larger design-based research (Sandoval & Bell, 2004) project to create and deliver personally-relevant science learning opportunities in informal learning settings, such as libraries, for rural families, the research team designed and facilitated astronomy workshops at rural libraries in the Appalachian northeast (Zimmerman et al., 2018). While designing these experiences, the research team focused on creating experiences that foster interest in continued science learning by striving to create learning experiences that are personal and relevant to the learners as well as foster family engagement in science talk.

In order to understand if families are engaging in science talk it is important to be able to identify what counts as learning talk (Allen, 2003). Eberbach and Crowley identified a progression of increasingly complex noticing skills children progress through in their framework on how children learn to observe in the biologist's world (Eberbach & Crowley, 2009). Minda Borun identified three progressively complex levels of learning that she found families typically moved through as they engaged with exhibits at science museums in her work on family learning (Borun, 2002). Borun's categories inspired the types of talk used to analyze the family talk in this study, although we do not view the families' talk codes as representing a progression or levels, but rather as intertwined ways of talking about science employed by families during sensemaking talk.

## Methods

Ten families, each consisting of an adult and one or two children aged 6-11, consented to participate in the research study for this first iteration of the workshop. Consenting families were videotaped during the workshop with audio recording devices placed at the tables or on the child, resulting in ten hours of video and audio recordings. Using a multiple case study approach, the video recordings of the consenting families were content logged, transcribed, and sorting activity video segments were coded by the family unit in V-Note by one researcher according to the types of sense-making talk they were engaging in: noticing, classifying, and applying.

## Findings

Coding for types of talk demonstrated that nine of ten families engaged in all three types of talk during the workshops. Of the three types of talk, noticing and classifying were the most common, occurring in similar amounts of total time when added up across families. Analysis of the patterns of talk showed two distinct patterns for the first sorting activity: (a) families that mostly engaged in noticing and classifying as seemingly separate activities and (b) families that tried to classify the images as they discussed what they noticed in them (Figure 1 depicts sample timelines). In both cases, the instances of applying talk are higher during the second sort than during the first.

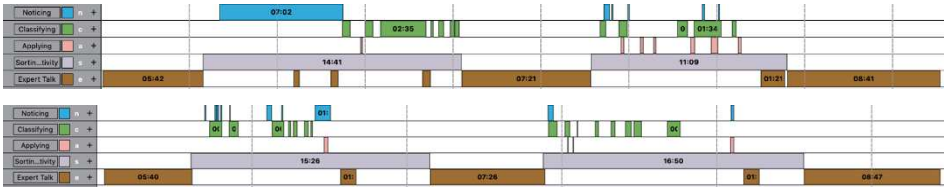


Figure 1. V-Note code timeline examples of two families' engagement in noticing, classifying, and applying talk.

 

The prompts in this galaxy workshop were designed to support families as they engaged in sense-making around telescope images. Regardless of whether prompts were provided in a workbook or as part of the community expert's oral prompts, there were multiple instances of families using the prompts as an epistemic resource to engage in science talk and build new knowledge together. In many instances during the second sorting activity families intertwined all three types of talk when making determinations (sense-making) about what they saw in the images and how to classify them.

## Discussion and implications

The findings above add an analytical account to the learning sciences literature of family talk in informal spaces. They point for a need to examine how types of talk are used when families engage in sense-making, but without using hierarchies or progressions (Borun, 2002). Nine of the ten families engaged in each type of talk, employed epistemic resources by incorporating the new information presented by the expert, and used the prompts and the new information to further their inquiry. Prior work on family conversation has shown that open-ended questions, such as those provided in the workshop prompts, promote children's understanding and learning about science (Haden et al., 2014). While there is strong evidence that the prompts helped the families engage in the types of sense-making talk that astronomers use to classify galaxies, especially the ability to notice important features and to determine similarities and differences, it is also evident by the limited amount of applying talk that there was not enough opportunity for families to incorporate new, expert information into their discussions and analysis.

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