



Using Storytelling for Effective Science Teaching: A Case Study of An Exemplary Scientist

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This material is based upon work supported by the National Science Foundation under Grant No. DRL 1322600 - "Transforming Students' Partnership with Scientists Through Cogenative Dialogues."



DRL 1322600

◆ Purpose & Problem

With the rapidly increasing number of STEM jobs, many scientists, mathematicians, engineers, and technology professionals have come together to teach and encourage students into pursuing STEM careers (Munson, Martz, & Shimek, 2013). However, scientists have challenges of communicating science to the public, mostly due to the complex language of scientific jargons and terminologies (Peters, 2013). The purpose of this ethnographic research is to demonstrate how an exemplary scientist used story telling to teach science. Drawing on Labov's Model Framework (Labov & Waletzky, 1997) and story purposes (Ochoa Villalobos & Hsu, 2017), we analyzed 112 stories in terms of different components of stories and purposes to better understand how stories could be told to communicate science.

◆ Research Context

- **Work with A Scientist Program**
 - 7 months (~210 hrs) internship
 - Open-inquiry scientific projects
 - Cogenative dialogues (cogens): open-ended discussion to improve teaching and learning
- **Case study about Dr. Smith's storytelling practice**
 - 1 scientist, and 9 high school interns

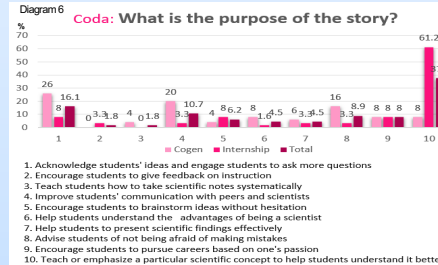
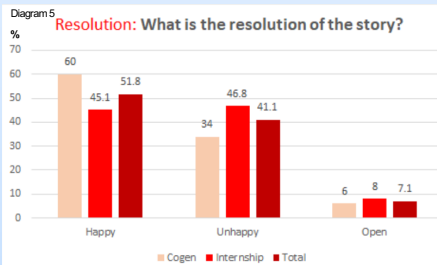
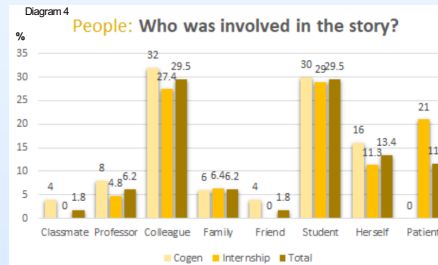
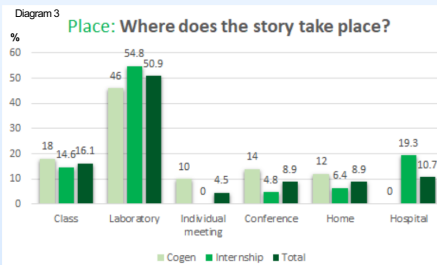
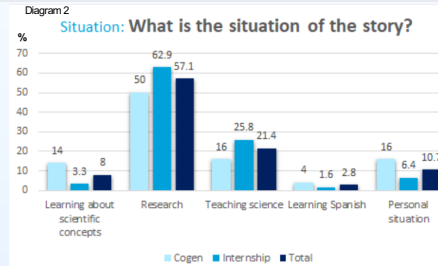
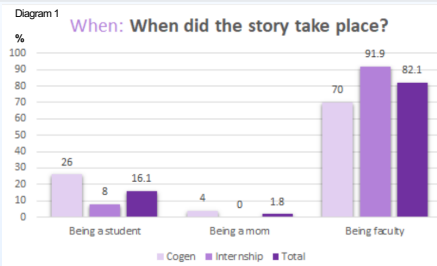
◆ Data Sources and Analysis

- **Data Sources:**
 - 2 year ethnographic data (112 stories)
 - Real-time video recordings
 - Field notes & Interviews
- **Data Analysis:** (De Fina & Georgakopoulou, 2012)
 1. **Object of analysis:**
 - Storytelling as communicative interactional process
 2. **General methodological approach:**
 - Qualitative (focus on small samples, distrust of pre-existing hypotheses, emphasis on observation and analysis of participants' understandings, discovery of units of analysis)
 3. **Methods of data collection:**
 - Research-independent (natural) contexts.
 4. **Types of data:**
 - Oral/interactional
 5. **Data analysis:**
 - Focus on content/themes (what are people narrating about)

◆ Theoretical Framework: Labov's Model (Labov & Waletzky, 1997)

No.	Labov's Model	Explanation	Story	Category
1	Abstract	The objective of the abstract is to summarize what the story is about. Abstracts are usually represented by one or two clauses that describe the gist of a story.	Okay. So you're going to set up an agarose gel. Any time you run a gel in the lab, it has to be buffered. And the reason why I tell you this...	
2	Orientation	Who, what, and when. These components orient the listener and help them understand the situation of the story.	So, I went to a good graduate school, and at the graduate school, somebody saw that the buffer was clear, and they thought it was water.	When: Being student Situation: Learning Place: Class People: Colleagues
3	Complication	The main focus of the story, where the other components revolve around. It presents the problem or issue.	And they ran—I don't know what they ran in there but they set the box on fire.	
4	Resolution	Resolution recapitulates the ending event of the story and explains how the initial complication or issue concluded.	And of course the [teacher] was so pissed and was running up and down the hall telling everybody about the idiot in his lab. Not nice, okay.	Resolution: Unhappy
5	Evaluation	Evaluation is an important element of a narrative, it emphasizes the point of the story and allows further analyzing.	So we're not going to make that mistake because you guys already know every time you see a clear solution in the lab, know what it is.	
6	Coda	Signals that the story has ended and brings listener back to the purpose of the story.	It's not usually water.	Coda (Purpose #10) Learning scientific concepts

◆ Results



1. Acknowledge students' ideas and engage students to ask more questions
2. Encourage students to give feedback on instruction
3. Teach students how to take scientific notes systematically
4. Improve students' communication with peers and scientists
5. Encourage students to brainstorm ideas without hesitation
6. Help students understand the advantages of being a scientist
7. Help students to present scientific findings effectively
8. Advise students of not being afraid of making mistakes
9. Encourage students to pursue careers based on one's passion
10. Teach or emphasize a particular scientific concept to help students understand it better

◆ Major Findings

- At average, Dr. Smith told 1.14 stories per hour during Cogen and 0.16 stories per hour during Internship.
- **When:** Most of the stories (82.1%) are based on incidents happened when Dr. Smith was faculty. (Diagram 1)
- **Situation:** Most of the stories (57.1%) are based on incidents happened when Dr. Smith or her colleagues were doing research. (Diagram 2)
- **Place:** Most of the stories (50.9%) are based on incidents that took place in a laboratory. (Diagram 3)
- **People & Place:** Stories based on incidents happened in a Hospital (19.3%) and involved Patients (21%) were only told in Internship (not in cogens). (Diagram 3 & 4)
- **Resolution:** Most of the stories (51.8%) end Happy. Stories tend to end Unhappy more during Internship (46.8%) than during Cogen (34%). (Diagram 5)
- **Coda:** Most of the stories during Internship (61.2%) are for purpose #10. Stories told in cogen had more diverse purposes during Cogen than during Internship (Diagram 6).

◆ Conclusion & Implication

- Storytelling is an effective way to communicate science. "It was extremely positive environment, Dr. Smith found ways to relate to us while teaching."
- Our analysis shows that Dr. Smith's stories were based on different stages of her professional life, situations, places, people, resolution, purposes in order to help students understand how to conduct scientific practice successfully. Science educators can use these findings to build their storytelling practice in order to communicate science more effectively.
- The main purpose of Dr. Smith's storytelling is to teach scientific concepts to students (purpose #10), especially during the internship. It shows that scientific concepts can be taught through storytelling, based on professional life or daily life stories (not necessarily just by scientific jargons and terminologies).
- Cogen provides more opportunities for Dr. Smith to tell more and diverse stories and can serve as an educational space to engage students into science.

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