

AN ABSTRACT OF THE DISSERTATION OF

Laura H. Good for the degree of Doctor of Philosophy in Science Education presented on April 30, 2013.

Title: Unpacking Docent Practice in Free Choice Science Learning Settings: A Qualitative Study Documenting the What and Whys of Docent Interpretive Practice

Abstract approved: _____

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Museum settings including aquariums, zoos and science centers rely heavily on their volunteer docent populations to interact with and communicate science and conservation concepts to the visiting public. The interactions docents have with museum visitors are important to meeting the educational expectations of museums and improving public science literacy as a whole, yet research to date is limited around docent practice, docents' reflections on that practice nor the sources for docents to learn that practice. Thus, we have little understanding of the interpretive practice docents actually undertake whilst interacting with visitors, why they choose to enact particular strategies, and how they came to learn those practices. Using a grounded qualitative approach within a framework of mediated action and cultural historical activity theory, this case study utilized video observations of docent practice at a science center, pre and post observation interviews, and focus groups to 1) document docent practices for engaging visitors, 2) explain those

practices from the docents' own perspectives, and 3) examine those practices from the point of view of how they align with teaching and learning theories and interpretive practice. Thematic analysis using constant comparative methods demonstrate four claims about docent practice: 1) docents view teaching in the museum as opportunities to spark interest with these new experiences. Practices are chosen to engage visitors in these experiences. Docents choose to highlight these experiences as they believe they are reasons to be engaged; 2) docents as teachers are perceptive about their audience. They pay attention to patterns and provide information in response to those patterns. Docents utilize a shared repertoire of practice and information in their community developed from understanding visitor patterns of interest; 3) docents care about their setting and the exhibits within it. They also care about the visitor experience as a whole, and have to be flexible when working with different types of learners. They believe that being a docent means balancing potentially conflicting roles; and 4) docents use interpretation as a pedagogy to engage visitors with science and create personally meaningful experiences.

Analysis of significant interactions between docents and visitors shows that such practices are mediated through a variety of discursive and physical tools and implemented by docents as a means of engaging visitors with science and conservation. Moreover, most of these skills appear to be learned on-the-job within their communities of practice, and while specific docent actions and skills may be different across contexts, member checks with docents working in other museum settings demonstrate the resonance of the findings across contexts. The findings of the study are placed in the context of interpretation theories of communication as well as research on docents as

lifelong, free-choice learners both facilitating and participating in societal STEM learning activity. Findings and methods of research from this study are valuable to the greater understanding of how docents learn and enact interpretive practice and the development of more effective professional development for docents in museum settings.

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Unpacking Docent Practice in Free Choice Science Learning Settings: A Qualitative
Study Documenting the What and Whys of Docent Interpretive Practice

by

Laura H. Good

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APPROVED:

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Dean of the College of Education

Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Laura H. Good, Author

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DEDICATION

This dissertation is dedicated to my nieces and nephews back home in the UK who remind me that no mountain is too hard to climb. Josh, Shelby, Ebony, Sonny, Jay and Caden I love you all dearly and miss you every day.

Unpacking Docent Practice in Free Choice Science Learning Settings: A Qualitative Study Documenting the What and Whys of Docent Interpretive Practice

CHAPTER I

INTRODUCTION

The Development of This Investigation

My research interests center on the practice of informal educators, their role in museum settings, and their development as learners themselves. I have become interested in informal educators since my own experiences as an environmental educator and program coordinator led me to consider simply why informal educators make particular choices about teaching, instruction and interpretation, and how they learn their practice and make those choices. Even more compelling to me was why the educational field seemingly understands so much about the practice and professional development of formal educators, and yet so little about informal educators, despite our growing understanding of how, what and why people learn outside of formal schooling. As such, I am driven to explore and develop greater theory and understanding around the practice of informal educators, particularly in museum settings.

Volunteers and docents are an interesting subset of informal educators who I became interested in whilst working on a number of evaluation projects as a research assistant. Throughout this work I soon realized the research literature around docents was fairly sparse, showing a particular gap around explorations of their practice and professional development, despite the extent to which museum settings maximize their

volunteer and docent workforce. I have pursued research around docent practice because, as a population who desire to learn new information and give back to their communities, better understanding of how these educators both learn and communicate science is all the more beneficial for better educational programming in museum settings. Additionally I believe, since many museums involve some form of docent programming, research around these educators encourages better research connections between different types of museum settings, connecting the field of free choice learning and informal learning better as a whole.

Problem Statement

As cultural institutions, museums have long been a part of the educational landscape in the U.S (Cremin, 1988) and offer unique free-choice learning experiences for a variety of visitors to learn together in the context of art, history and science. In recent years, museum settings including informal learning sites such as science centers, aquariums, zoos, botanical gardens, natural history museums and state/national parks (Dierking et al., 2004; Falk & Dierking, 1992) show increasing significance for public learning and education (Hein, 1998). Docents, a term used to describe volunteer interpreters, educators, instructors, tour-guides or even teacher-guides (Burcaw, 1997), play a critical role in the educational role of museums, and are arguably the most widely used resource of staff in the field as museums become increasingly dependent on volunteer assistance with exhibitry and education programming (Grinder & McCoy, 1985). Docents facilitate learning in the museum in a variety of ways, including teaching

structured programming, leading tours and interpreting exhibits. For the purposes of this study, I focus in particular on docents who interpret exhibits to visitors on the museum floor. Interactions docents have with the public are unique interpretive opportunities that docents are able to adapt to suit the needs of the audiences they encounter and to communicate information relevant to the context they serve (Castle, 2001; Grenier, 2011; Grinder & McCoy, 1985). However, to date little is understood about these practices or the reasons for and decision-making processes behind how docents choose particular interpretive strategies with visitors, particularly in the context of science-based museums. Such information is necessary to better understand the needs of docents as learners and facilitators of both science and interpretation as the field increasingly recognizes the need for more effective professional development for informal educators. At the same time, there is very little research on how docents learn or on what docents actually do that could be used as the foundation on which professional development might be built. Professional development and volunteer training practices are dependent on understanding the needs of docents as learners in the museum field.

Project Description

In order to begin to serve that need, this dissertation describes a qualitative study that took place at a marine science visitor center in Newport, Oregon, on the West Coast of the United States. The study explores docent mediated action as part of docent interactions with visitors to the museum setting. In this study, I investigated how docents shape their interactions with visitors in an attempt to create or influence learning

interactions and explore the development and action of interpretive practice within a particular docent community of practice and as one aspect of overall societal STEM (science, technology, engineering and math) learning activity.

The study triangulated “visitor-eye view” video observations, semi-structured interviews, and video-stimulated docent reflection to document what docents do as interpreters in terms of discourse and action, why they choose to engage in particular practices and their sense of where these practices come from. This case study involves docents and visitors in the process of unpacking docent practice. Further, it seeks to generate theory around how docents learn, enact and adapt interpretive skills as a community of learners and as part of a community of practice.

In this work I approach the analysis of docent interactions with museum visitors as (1) the examination of mediated action comprising docent interpretive practice developing over time as part of participating in a community of practice and 2) practice that involves levels of docent choice and control over the tools they use to promote engagement in science. The approach encompasses ideas based on science and environmental learning in museums, docent practice as interpretation, docents as lifelong learners, and an apprenticeship model of docent learning through participation in a community of practice. The outcomes of this study can provide recommendations for training docents from a community of practice perspective. Such information is not only useful to understanding the process of museum interpretation, exhibit or activity designs, but also other science outreach ventures in the future.

Summary

Docents are a vital component of the educational landscape in museum settings, yet the field is lacking groundwork understanding of their communicative practice whilst interacting with visitors. In the following chapters, I will situate my research within theory surrounding the role docents play in museum settings, their practice as informal educators and where they learn that practice. I present my results and discuss what, how and why particular practices are utilized by docents in the case study of a marine science center.

CHAPTER II

LITERATURE REVIEW

The following literature review is meant to provide context surrounding the educational practice of docents in museum settings. The research described here is divided into seven sections corresponding to five identified strands in the literature: (1) Environmental science learning in museum settings, (2) informal educators in general, (3) the role of the museum docent, (4) docent practice, (5) docent communities of practice, (6) docent lifelong learning and (7) environmental interpretation and interpretive practice.

Environmental Science Learning in Museum Settings

Free choice learning describes lifelong learning activities from the perspective of the learner that most frequently take place outside of school (Falk et al., 2009), and recognizes the socially constructed nature of learning driven by the intrinsic needs and interests of the learner as they interact in their sociocultural and physical environments (Falk, 2001). Here, learners have choice and control over educational opportunities as they are presented and have their own motivations and agendas for learning as they construct their own meaning out of the learning situation (Heimlich & Storksdieck, 2007). Museums are complex learning communities and sites of free choice learning for the public (Falk & Dierking, 2000). Museum settings are able to provide accessible content, encourage visitors' motivations to gain new knowledge and interests, and impact visitors' thinking and world views (Falk & Dierking, 1984). As a result, they have

become increasingly significant to public education and out-of-school learning experiences over the last few decades (Hein, 1998), and are identified as important cultural institutions where visitors can learn together socially (Falk & Dierking, 1992). Museum settings come in a variety of forms, encompassing science museums, aquariums, zoos and interpretive centers, and as such are able to offer STEM learning experiences according to the focus of their collections, be it living or non-living, which allows them to play an additional role in public science literacy and ecotourism (National Research Council, 2009). The fact that informal science learning consensus studies exist, such as that published by the National Research Council (2009), indicates an acknowledgement that museums and their activities play a significant role in societal STEM learning activity.

Museum settings present unique contexts for science learning and delivering environmental messages (Falk, 2005; Falk et al., 2009) by helping support environmental literacy efforts to produce more scientifically informed citizens, better public decision-makers and empathy for environmental issues that can lead to better stewardship and conservation behaviors (Myers et al., 2009). Conservation learning, whereby conservation messages communicated to visitors are designed to encourage visitor attitude and behavior change, has become a significant focus for museum settings in recent years (Ballantyne et al., 2007). There is also increasing interest in how memorable wildlife tourism experiences have the potential for influencing long-term conservation behavior (Ballantyne et al., 2011).

A good example of how all these outcomes may be supported by a museum can be found in the current national focus in the U.S. on ocean literacy. Over the past 10 years, a growing number of environmental and science educators working on ocean science education topics have rallied around the concept of ocean literacy; that is, the concept of developing an ocean literate society where individuals understand the ocean's influence on their lives and their influence on the ocean, (Cava et al. (2005). Museum settings (and aquariums, zoos, and coastal parks in particular) are important sources of information about the ocean because they are both trusted and expected by the public to educate about environmental and conservation issues as well as provide guidance on how to address these issues on personal and societal levels (Falk et al., 2007; The Ocean Project, 2009). In the case of ocean literacy efforts, museum settings are already recognized for their contributions to science and environmental education, not based simply on the sheer numbers of visitors they host, but also on their strengths in promoting interest and motivation about the environment to a range of audiences through a diversity of methods for teaching and learning (Falk, 2005; US Commission on Ocean Policy, 2004). The importance of museums, zoos and aquariums as accessible and widely accessed resources for public audiences is also recognized. One-hundred and seventy-five million visitors attend zoos and aquariums alone in the United States annually (Association for Zoos & Aquariums, 2013). They are thus trusted and expected to deliver STEM and conservation messaging and reach a very large population (Lipardi, 2013).

Informal Educators

Educational staff in museum settings or, for the purposes of this study, informal educators are vital to fulfilling the educational goals of an organization and work to meet the perceived learning needs of the variety of audiences they encounter by seeking ways to help visitors create meaning out of their experiences (Patchen & Grimes-Rand, 2007). These educators are the interface between the museum and the public through a diverse set of responsibilities involving the development and delivery of programs that is both specialized and object-orientated (Tran, 2008b; Tran & King, 2009), and as educators, they often focus on their role as informers and are concerned with not only content knowledge, but also audience awareness (Ballantyne & Hughes, 2001). Informal educators have also been shown to be very competent observers of visitors (Rennie et al., 2007) and are aware of the needs of their audience as learners as well as how to gauge visitors' likeliness to participate in activities and questions they might have in the museum setting. They employ a variety of instructional strategies when communicating science to public audiences and show an affinity for flexibility and creativity for developing learning experiences (Tran, 2007). In essence, skilled interpretative staff can positively influence learning experiences for visitors and help facilitate meaning making (Falk & Dierking, 2000) by aiding meaningful social interactions and conversation between visitors. Lastly, informal educators have been shown to, in general, have a strong value system that attracts them to the museum profession, a thirst for learning, enjoy encouraging learning in visitors and believe they are contributing to the greater good (Bailey, 2006).

As discussed by Tran (2007), museums are teaching environments and, despite different complexities to teaching science in the museum setting (Tran, 2003), there can be strong similarities between science teaching found in museums and science teaching found in schools, particularly with more structured programming (i.e. for visiting schools). Specifically, evidence of didactic teaching has been found in museum settings (e.g. Cox-Petersen et al., 2003; Tal et al., 2006; Tran, 2002, 2003, 2007) where informal educators may transfer formal pedagogy into museum programming as a reflection of their training and experience (Tran, 2007). A lack of professional development to prepare informal educators for teaching in the museum may encourage that transfer. There is the suggestion therefore that professional learning of informal educators is reliant on prior teaching experience. Castle (2006) explains that museum teachers also learn primarily from the observation of other educators, and thus suggests that one way to address this issue is to blend instruction in pedagogy with content by means of providing training that encompasses concepts of learning and learners, utilizes more fluid processes of development, and grounds museum teaching in the context of the museum setting, which in turn can help to fulfill the potential of informal educators. Another suggestion for addressing this concern has been to encourage professionalization of museum staff through means of the development of a shared professional language (Tran, 2008a). Both of these suggestions represent significant shifts in the way that informal educators, and especially docent staff, both paid and voluntary, are currently trained. Moreover, conversations about professionalization in particular often focus on the day-to-day reality of paid staff but do not take into account the specifics of the practices of volunteer staff.

Thus, though there is growing discussion, although still limited, around the move towards a paradigm shift in the professional development practices of informal educators, it is hampered by a lack of documentation of the actual lived practices of informal educators, especially volunteer docents.

The Role of the Museum Docent

In 2012, 16.5 million people in the US volunteered in educational or youth services (Bureau of Labor Statistics, 2012); approximately 1 million of these people volunteered in museums and cultural institutions (American Association for Museum Volunteers, 2013). These volunteers may work in all aspects of an organization from printing and mailing, to developing and delivering programming, to interacting with the public audience in multiple roles. Docents – sometimes referred to as interpreters, explainers or teacher-guides (Burcaw, 1997) – are those museum volunteers who work directly with the public and make up a significant proportion of museum informal educators. Non-profit settings like museums are often dependent on these populations (Goodlad & McIvor, 1998; Holmes, 2003) because they provide not only economic value (Tedrick & Henderson, 1989), but are central to staff-visitor interactions (Abu-Shumays & Leinhardt, 2002; Falk & Dierking, 2000; Grinder & McCoy, 1985). They also bring their own interests and self motivation to learn to the table as “the ultimate frequent visitor” (Millar, 1991). Volunteers and docents are an interesting subset of informal educators because although they are often trained similarly to staff and other educators, their motivations to work and their perceived benefits from that work may actually be

more reflective of those of visitors rather than of paid staff (Holmes, 2003). Such motivations can relate to high quality experiences for the visitors they encounter (Goodlad & McIvor, 1998). As members of a community of informal educators, docents play an integral role in communicating science to the public through interpreting exhibits, modeling learning behaviors, initiating conversations and acting as information resources for visitors. They do this largely through conversational interactions, which have been shown time and time again to be important elements of learning in informal contexts (Ash, 2003; Kisiel & Rowe, 2012; Leinhardt et al., 2002; Rowe, 2002, 2004; Rowe et al., 2002) because they create both an outcome for museum learning as well as a process of engagement for learning in the museum context (Leinhardt et al., 2002). Therefore, as facilitators, docents can offer unique opportunities for science learning in museum settings. For the purposes of this study, I shall use the term “docent” to describe volunteers who work in an interpretive role and actively and directly interact with visitors in a museum setting.

Docent Practice

What we know about docent practice specifically is unfortunately rather limited, and what exists is generally focused on docent preparation and management (Grenier & Sheckley, 2008), takes place outside of science contexts in art and history museums, and discusses interpretation in the context of tour-guide programming (e.g. Castle, 2001, 2006; Grenier, 2008, 2011; Grenier & Sheckley, 2008; Neill, 2010). What we do know

from this pool of research is that as educators expert docents have a combination of characteristics, including:

- command of content knowledge,
- communication skills,
- the ability to integrate prior experiences,
- adaptability,
- enthusiasm,
- and a sense of humor that can be fostered through learning opportunities that both inspire and promote personal growth for the benefit of both themselves as learners and the learners they serve (Grenier, 2011).

As a realm of informal educators, docents expectedly hold similarities to the practice of informal educators; however, the diversity of their roles and responsibility is more limited to direct, less structured interaction with visitors (e.g. as opposed to organized presentations to visiting school groups, for example). The more direct interactions provoke interesting conversation around whether docents are more interpreters than teachers, which is reflected in the wide variety of names associated with docent roles.

As many informal educators view content knowledge as paramount to good communication (Ballantyne & Hughes, 2001; Dover & Rowe, 2010), and content knowledge is somewhat of an acquired or expected docent characteristic (Grenier, 2011), learning opportunities and trainings for docents tend to be heavily content-focused (Cox-Peterson & Ramirez, 2001; Dover-Good & Rowe, 2012; Grenier, 2009). There is also some evidence that much of the professional development that occurs for docents is

traditional and didactic in format (Cox-Petersen et al., 2003; Grenier, 2005a). This didactic teaching framework actually contrasts with how most docents actually learn content and skills as discussed in the section on communities of practice below and as the results chapter will demonstrate.

At the same time, some research has shown that content learning opportunities for both informal educators and docents specifically are most effective when grounded in the context of the setting, such as through modeled and reflective practice within their community of practice (Castle, 2006; Grenier, 2009; Iverson & McPhee, 2008). Highly contextual, informal learning is thus more likely to be effective for developing docent practice and expertise than teacher-fronted, formal teaching around content (Grenier, 2009). Such a notion is particularly poignant when thinking about how docents communicate science in line with the educational goals of a museum setting; if docents hold traditional, didactic models for communicating messages to the public, this may be their primary model for presenting information to visitors (Chin, 1995; Mony & Heimlich, 2008). As a result, it seems there are similarities in the issues surrounding the preparation of docents to those that surround the preparation of informal educators as a whole.

What we are missing from our understanding of docents is how they, as informal educators, communicate or interpret science as they interact with visitors and how they learn those skills, content, and practices. There are very few studies that break down the practice of docents as it exists in the context of learning in museums. (e.g. Abu-Shumays & Leinhardt, 2002; Castle, 2001; Chin, 1995; Cox-Petersen et al., 2003), and in these

cases, even fewer are solely concentrated on docents in science museum settings. It is in the interest of the museum field as a whole to better understand how docents a) converse with and attempt to engage visitors with science, b) how they explain those actions and c) how they learn to do those things in order to link informal educator professional development practice with public needs, enhance resources and aid informal educator personal assessment; steps towards more reflective museum education practice, and bridging the gap between research and practice (DeGregoria Kelly, 2009).

Docent Learning in Communities of Practice

A community of practice describes a group of people who share common concerns, interests and goals, and interact regularly as they move towards deepening individual knowledge of their shared enterprise (Lave & Wenger, 1991; Wenger et al., 2002). The term was developed by Lave and Wenger whilst looking at social relationships in apprenticeship studies, considering learning in the context of participating in a community (Wenger, 2006) where learning is part of the sociocultural processes of the community (Wenger, 1999). Here, learners become members of a community of practice through legitimate peripheral participation with other members, moving towards full participation in the social-cultural practices of that community (Lave & Wenger, 1991). Members therefore mutually engage in common activities in a sustained pursuit of shared enterprise (Wenger, 1998). Communities of practice show educational potential for the professional growth and development of educators (Clarke

& Hollingsworth, 2002; Little, 2002), as well as educators' response to reform-based practices (Gallucci, 2003; Little, 2003).

In the context of museum settings, staff can operate within and between sets of overlapping communities of practice as a means to enhancing programmatic and professional development. Informal educators tend to work within their own communities of practice (Lave & Wenger, 1991) within their organizations. Informal educators are also part of the museum community of practice as a whole and help engage visitors in learning in a variety of ways often determined largely by the goals of the visitors themselves (Falk & Dierking, 2000). This means that docents are likely to develop their expertise as educators both alongside and in conjunction with other staff, peers and visitors, and thus, their development as docents is related to their participation in multiple, nested communities of practice (e.g., informal educators, museum volunteers, interpretive docents). Figure 1 illustrates an example of such nested, or overlapping, communities of practice in a museum. Here, an individual community or "shift" of docents who work together regularly are simultaneously located within the community of practice of the larger docent community, and the communities of their volunteer and education staff peers. Development of expertise is theoretically transferrable between the multiple communities they are part of.

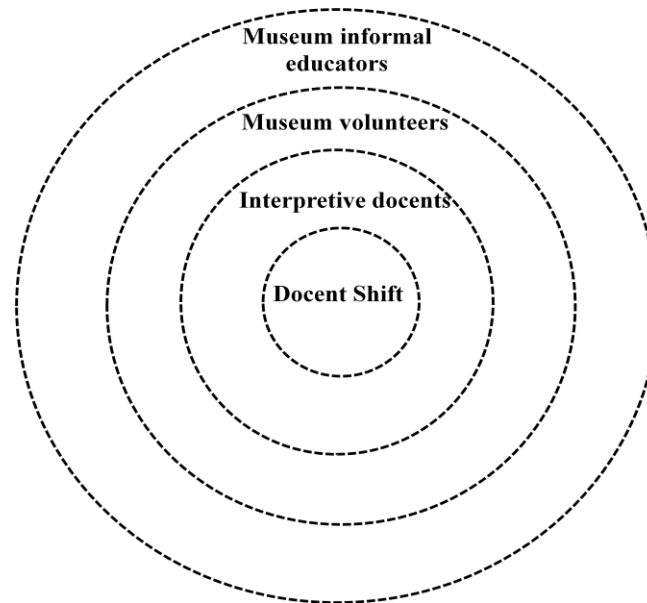


Figure 1: Nested Communities of Practice. Diagrammatic example of nested communities of practice in a museum, each circle represents a different potential community of practice within which an individual docent may work and learn.

One form of explicit participation in a community of practice is via professional development. Most museum settings employ some sort of initial or ongoing docent trainings that includes orientation to the organization and its structure, rules and regulations, as well as some sort of content related to the organizational mission (a volunteer management practice recommended by both Grinder & McCoy (1985) and Goodlad & McIvor (1998)). As an example, at Oregon Coast Aquarium, in Newport, Oregon on the West Coast of the United States, newly recruited docents are expected to attend a six-week training program that covers information about the aquarium, relevant marine biology of both the animals exhibited and the Oregon Coast, and the interpretation of their exhibits. (Dover & Rowe, 2010; Oregon Coast Aquarium, 2013).

A second form of participation in a community of practice can also occur “on the job” through legitimate peripheral participation (Lave & Wenger, 1991) or apprenticeship with museum workers (e.g. husbandry, curator, exhibit design or educators) and other more experienced docents (Abu-Shumays & Leinhardt, 2002; Dover & Rowe, 2010; Grenier, 2005b, 2009). In this case, docents’ understanding of the institutional goals, exhibit content and interpretation (i.e. expertise) develops by working in proximity to more experienced community workers to become more central members in their community (Collins, 2006; Grenier, 2005b). Understanding docent professional development and the development of their expertise within these communities of practice is therefore important to more detailed understanding of how that practice develops and its origins. What seems limited in prior research is an understanding of the practices docents themselves have designed, created or developed in collaboration with their community of practice, and how the communities of practice influence the choices docents make about practice.

Docent Lifelong Learning

Volunteers carry a multitude of prior knowledge, experience, interests and motivations with them as they fulfill their roles, but may feel less effective at or interested in their position if they are not orientated towards their own growth, learning and excitement (Tedrick & Henderson, 1989) or feel they are contributing to the community at large. Docents therefore, as a group of highly motivated lifelong learners, can assume a dual role: on the one hand they are learners learning with their peers, and on

the other hand, they are educators as they interact with visitors (Abu-Shumays & Leinhardt, 2002). Grenier (2009) describes the informal learning opportunities for docents as they develop their expertise and how docents purposely learn from others in their communities of practice by means of self-directed learning. She explains that this runs alongside more formal opportunities such as trainings, and incidental opportunities, where docents may unconsciously learn expertise while on the job, what others have called “tacit” or “implicit” learning (Thomas & Brown, 2011). The intertwining of these learning opportunities are an important consideration in examining docent practice, as they are themselves not only sources of learning for that practice, but also the opportunities that drive a docent’s personal motivations for being a volunteer.

Environmental Interpretation and Interpretive Practice

One of the most common ways to talk about the work of docents in museum settings and throughout the environmental education literature is through the construct of “interpretation.” In everyday language, the term interpretation can refer to a range of ideas from the translation of text or language to the processes by which we make sense of experiences or information. In the early part of the 20th Century, Freeman Tilden introduced the idea that environmental interpretation was “an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experiences, and by illustrative media, rather than simply to communicate factual information” (Ham, 1992; Tilden, 1957). The professional sense of the term interpretation is based upon the idea of “translating” scientific language and phenomena

into an entertaining and interesting learning opportunity for members of the public through transferring ideas and relationships (Ham, 1992). Effective interpretation generally involves the establishment of clear themes around scientific information and a message (often a conservation message) being portrayed by the interpreter who utilizes a number of engaging language and activity tools known as “hooks,” stories, hands-on interactive opportunities, analogies and novelties to create personally relevant learning experiences for visitors (Ham, 1992; Pierssené, 1999).

Interpretation as a framework for communicating science has become commonplace in museum settings as a set of practices for creating interpretive programming, signage and exhibits (Hooper-Greenhill, 1999a). There are many correlations between the practice of interpretation and the educational practice of informal educators in museums. This relationship, however, may not always be made explicit in the literature, or, in fact, in actual day-to-day museum practice. In essence, research around informal educator practice may actually discuss interpretive practice, even if that practice is not explicitly described as such. As an example, museums often strive to use analogies in signage, and often discuss this in terms of good communication rather than interpretation. Authors such as Borun, talk about making ideas (e.g. in text) in museum settings personally relevant, but never actually invoke interpretation literature (e.g. Borun et al., 1996; Borun et al., 1997; Borun et al., 1993). As it seems, there has been some hesitancy in informal science education research and practice to call what some informal educators do as interpretation, which may have reflected on (or be reflective of) what educators and settings themselves recognize in practice. There are

however authors such Bitgood and Serrell who throughout the years have begun to integrate interpretation literature more and more into their discussions around museum learning, where in their original work it was somewhat lacking (e.g. Bitgood, 2000; Bitgood et al., 1994; Serrell, 1996). Such difference in the interpretation of interpretation itself highlights the necessity to continue to develop our understanding of learning in informal contexts in relation to what we know about interpretation.

Interpretation is, in essence then, a method of pedagogy which is largely used in informal learning settings (Durant, 1992; Hooper-Greenhill, 1999a; National Research Council, 2009; Tilden, 1957). Interpretation as a field is relevant to the consideration of docent practice because it has become not only a normative approach for informal educators and museum docents alike (whether explicitly or implicitly seen as such), but also a way of describing the activity that docents engage in while they interact with visitors. Interpretation can thus be seen as both good pedagogical practice in museums and also as descriptive of what docents actually do (Neill, 2010). This project takes a descriptive rather than normative approach to interpretation not assuming that it is what docents in the study should be doing, but trying to describe what they are doing as it relates to interpretive practice. Interpretation may be useful in allowing us to make sense of why docents may *believe* particular actions and discourse they use in interacting with visitors may be effective.

Throughout this work, I will be using the term interpretation in the professional sense described above, and I will be exploring docent activities, interactions with visitors, and how docents themselves reflect on and discuss those activities from the point of view

of interpretation as a communication framework. One potentially interesting outcome of a study with such an approach is to more closely link the literature and traditions of interpretation with those of informal science communication.

Summary

The literature review above provides context in which to interpret the findings of this study. Museums are established institutions for public learning in terms of environmental science and conservation, such as with ocean science, and docents play an important role as a community of practice within a network of informal educators in interpreting that science to visitors. As educators, docents are aware of the needs of the visitors they encounter, and may adjust their interpretive practice to suit different learners. However, docents are also learners themselves, and as practitioners are influenced by and continually influence the various, nested community of practice they belong to directly and indirectly, as well as their personal goals and training opportunities that are presented to them within specific communities of practice. In this regard, the needs of docents as learners are as significant to visitor learning in museums as the practices in which they participate. The literature review highlights a gap in the field in terms of baseline information about what docents do as interpreters and educators and how they learn that practice. Therefore, this study begins to address this need by examining a docent population and its interpretive practice.

CHAPTER III

METHODOLOGY

Theoretical Perspective

Sociocultural Perspective

The sociocultural nature of learning provides a theoretical perspective appropriate for providing insight into docent interpretive practice without specifying particular theories as to how it happens and why. Such a perspective is appropriate because it provides a basis for understanding the social interactions that take place between visitors and docents as those visitors participate in a free-choice museum learning experience, as well as the development of docent interpretive practice within their communities of practice. From a sociocultural perspective, higher mental functions originate in and develop as part of culturally and historically specific social processes such as conversations, and individual development is guided by social interactions as learners internalize (Vygotsky, 1986; Valsiner, 2000) or appropriate and master (Wertsch, 1998) the tools and skills of a larger culture, a particular social group, or a particular community of practice. A learner develops their own ways of using shared tools and strategies through interaction with peers and cooperative dialogue with more knowledgeable others in socially meaningful activity (Valsiner, 2000; Wertsch, 1981).

Educational research around activity theory (Engeström, 1999; Leont'ev, 1974; Wertsch, 1981) and mediated action (Wertsch, 1985, 1998) has developed from Vygotsky's ideas on the communicative and cognitive roles of mediating artifacts or

cultural tools, his notions that the development of higher mental functions require individuals to experience those artifacts in the external world and as part of a social context (Vygotsky, 1978), and his idea that those mediating tools are internalized by learners going from being tools mediating communication to tools mediating cognition (Vygotsky, 1978, 1986). Mediated action among groups of learners provides a link between the actions associated with learning and the cultural, institutional and historical contexts in which those actions occur (Wertsch, 1998). Here, the unit of analysis is object-orientated action mediated by cultural tools (Vygotsky, 1978), where agents use cultural tools based on the (implicit or explicit) goals of the activity they participate in.

Mediated action is relevant to understanding the practice of docents because, like many informal educators, much of their interactivity with visitors is object-centered (e.g., creatures within a touch tank, artifacts) and their goals for communicating science are structured around using different communicative tools (e.g., ways of talking or interacting) and cognitive tools (e.g., techniques of observation) to engage visitors with that object. As such, mediated action is an important concept to consider in this study because action and discourse (i.e., deployment of cultural tools toward specific implicit or explicit goals) captured during observations of docent-visitor interactions become a key analysis area in the consideration of how docents communicate science. The understanding of docent practice is dependent on understanding how docents mediate interaction between objects in museum settings and visitors.

Engestrom's (1999), cultural-historical activity theory (CHAT) explores learner development at the social and cultural level of analysis, and was developed from

Leont'ev's (1974) and Vygotsky's (1978, 1986) ideas surrounding mediated action from an interpersonal level of analysis (Cole & Engeström, 1993; Yamagata-Lynch, 2010). Both CHAT and mediated action are important theoretical frameworks for this study because their application helps to generate theory around actions that take place between docents and visitors, as well as the physical and discursive tools docents use to engage visitors. Mediated action allows us to describe the docent practice taking place. The application of activity theory in this study can also be useful for explaining the decision making processes docents engage in to operationalize that practice, based on their learning and development within their community of practice. CHAT helps to identify object-orientated activities critical to answering the research questions, while examining the collective meaning making processes, illustrated by figure 2 (Yamagata-Lynch, 2007).

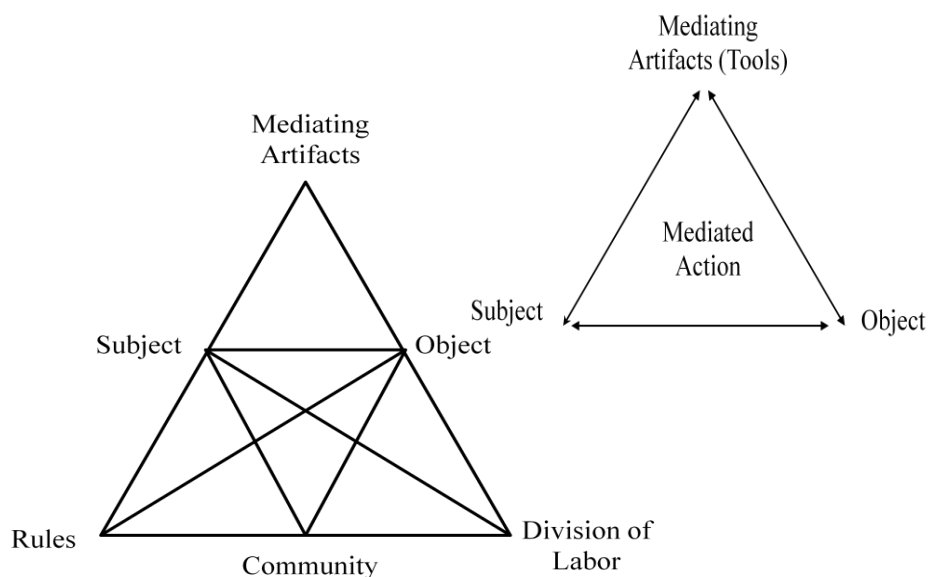


Figure 2: CHAT and Mediated Action Triangles. In both cases, the subject is an active human agent. Both approach agent(s) using mediational means (or cultural tools) toward some implicit or explicit goal as the unit of analysis, adapted from Cole and Engeström (1993)

In essence, the application of mediated action and activity theory allowed me to explore the how, what and why questions surrounding docent practice. Both activity theory and mediated action use mediated action itself as the unit of analysis; however, mediated action often tends to focus on the agent-tool interactions, while activity theory with its addition of analyses of roles, community rules, and division of labor usually seeks to put that mediated action into a broader social, cultural, or historical context.

Both approaches are therefore complimentary concepts for this study and provide a means for documenting and making sense of the interpretive practice of docents through an activity lens. For my particular analyses, mediated action focuses the data collection and reduction process while CHAT shapes my focus on agents (docents) using cultural tools and mediational means (conversation and actions) to achieve certain goals in the activity and allows me to move from the level of a docent interacting with a visitor to the make conclusions about docent practice in my study site and perhaps beyond. This is similar to the approach taken by Bachman (2011) while examining free-choice science learning activities amongst home school families. Looking at these activities in the context of the communities of practice allows the study to take account of not only where those activities derived as a form of interpretive expertise, but also how the cultural tools and mediational means used in the activities are shaped by the docent goals for interpretive activity.

In light of these theoretical underpinnings, the study takes a sociocultural approach to understanding how docents interact with visitors in museum settings. From a mediated discourse analysis and activity theory framework, the action and discourse that

takes place between docents and visitors is mediated by the cultural tools they employ and described by how they deploy those mediational means and cultural tools during interactions with visitors. Further, the particular group of docents in the study is examined in light of the theory of communities of practice. In essence, CHAT is used to describe the probable sources and ways in which docents talk about those tools shared by their community of practice, while discourse analysis focusing on how cultural tools like language and gesture mediate specific interactions among docents, objects and visitors is used to document how what participants say and how they deploy non-linguistic communicative modes such as gesture, and touching.

Purpose of this Study

Rationale

As the literature review indicated, there are significant gaps in our understanding about *how* docents actually interact with visitors and the practices they employ to communicate science with visitors. What we know about docent-visitor interaction is sparse in a science education context, and thus it is important we use our understanding of informal educators and interpretation in museum environments to supplement our understanding of docents in science education and learning contexts. Secondly, although we have some understanding of the motivations of docents to communicate science with the public, we have little understanding about their perception of docent roles and responsibilities, as well as their own practices and decision making processes associated with making choices about practice. As Neill (2010) points out, it is rare a study on

docents centers on the docents themselves and their perceptions of practice; thus, more grounded theory work is necessary to unpack docent practice in its current state and build coherent theories of docent practice. Lastly, our understanding lacks a clear sense of whether significant connections exist between docent practice and interpretive practice, and the extent to which docents and museum settings themselves perceive they are involved in interpretive practice. Again, Neill (2010) suggests that there is evidence for interpretive techniques being utilized by docents, but there is very little other prior work around this idea. Studying docent practice can contribute to the fields of museum studies, free-choice learning, and educational research because it can help use better understand the needs of docents as learners and the practices of docents as informal educators. Such information is essential to pursue in order to develop not only professional development and learning opportunities for docents and other informal educators alike, but also more effective and engaging learning experiences for the audiences museum settings serve overall.

Research Questions

In response to these concerns, the research study described here explores docent practice from the perspective of participating volunteers in one informal context which combines elements of both interactive science museums and public aquariums. The study looks to provide information about and generate theory from how docents communicate science in interaction with visitors, the interpretive strategies they adopt (either implicitly

or explicitly) and how these relate to their experiences, training and ongoing education.

Several goals drive this study:

- a) Document and describe strategies docents employ to communicate science whilst interacting with visitors in a museum setting.
- b) Explore how they explain their choices for those strategies.
- c) Examine the possible origins of these practices.

To move toward these goals, the study is guided by three research questions:

- 1. What are the strategies and tools docents employ whilst interacting with visitors in a museum setting?**
- 2. How do docents choose to employ such practices and how do they explain them?**
- 3. What sources for these practices do docents themselves suggest?**

As part of answering these questions, the study investigates a docent population at a museum setting in terms of their discourse, action and perception of their practice.

Methodological Framework

Descriptive Case Study Approach

While taking a broadly sociocultural approach to exploring learning and interaction, the study was based on a qualitative, grounded theory approach to explore docent practice. Here, theory is discovered and emerges from data (Glaser & Strauss, 1967) in order to describe and explain docent practice taking place in a museum setting.

As my interests are in an area that is not well theorized, I employed such an approach in an attempt to generate theory from a descriptive case study of docent practice in a single case of docents in a single science museum setting. The descriptive case study allows for intensive study of a single unit, or bounded phenomenon, to bring to light features of a similar phenomena (Gerring, 2004), and when applied qualitatively with a variety of data sources can facilitate the exploration of that phenomena (Baxter & Jack, 2008) as a means to answer “how” and “why” questions when the researcher cannot manipulate the behavior of subjects, and the case cannot be considered without the context of its setting (Yin, 2009). The application of the case study approach was therefore appropriate because of its ability to reveal the essence of docent practice as a phenomenon (Baxter & Jack, 2008) while enabling me to generate a detailed theory of docent practice from the perspective of practitioners themselves in the context of the museum setting. In the scope of mediated action and CHAT, the unit of analysis within this case study was the activity observed and discussed, i.e. using a grain size of the docent practice itself as it occurs during interactions between visitors and docents. Activity is defined as an agent (a docent) employing some mediational means in the pursuit of some end goal.

Generating a Theory of Docent Practice through Naturalistic Study

The study looked to further understanding of docent practice for future investigations rather than to generalize (in the traditional sense) docent practice across museum settings (Auerbach & Silverstein, 2003); however, naturalistic generalizations, or self-generated knowing gained from experience, were sought as a way of describing

both the direct and vicarious experience of the practitioners as key informants in a naturalistic study of the reality of the practice taking place in the case at hand (Stake & Trumbull, 1982). Those generalizations serve as an opportunity to modify old generalizations (Stake, 1995), promote larger discussion and interest in this area of research and practice, as well as improve that practice (Stake & Trumbull, 1982).

Triangulated Sources of Data

Because I was interested in the details of practice as they emerge in interaction as well as participants' perspectives on that practice, the study employed video observation of interaction, interviews with individual docents about practice, and docent self-reflection on videos of interaction as its primary sources of data. Member checks both with case study subjects and with docents working in similar organizations regionally were used as secondary data sources.

A variety of research tools including interviews, surveys, video observation and focus groups, were necessary to address both the complexity of the museum setting and the action and discourse enacted between docents and visitors during their interactions as well as to promote docents' post-interaction reflection, or stimulated recall. Such tools provide a means for the triangulation of data throughout the study for theory development (Cobb et al., 2003) and add rigor to the investigation. As I explored the docent community of practice in terms of their experiences and practice as docents, it was important that this study looked closely not only at their regular activities, but also how they reflected on those activities, and their learning experiences around that reflective

action in an attempt to explain as well as document practice. The approach is similar to that taken by Tran & King (2009) whilst examining the practice of science museum educators in the United Kingdom.

Data Collection

Organization of the Data Collection

The data collection was divided into three phases, as highlighted in figure 3.

Phase one focused on video observations of docent practice, alongside preliminary interviews conducted just before observations took place. Video observations focused on the observation and documentation of docent practice as docents interacted with visitors, whilst preliminary interviews centered on docent prior experience, perception of role, and approaches to practice through semi-structured interviewing.

Phase two focused on reflective practice by examining the reasoning of docents whilst reflecting on their video observations shown to them during follow-up semi-structured interviews and volunteer community focus groups.

Phase three included member checking activities with docents working at other institutions in order to examine the broader applicability of the outcomes to similar docent communities.

The three-phased approach enabled detailed naturalistic observation of docent practice, as well as the documentation of the personal and sociocultural subjective experiences of docents participating in those observed practices, allowing participating docents to reflect on their own practices as well as practices of their peers.

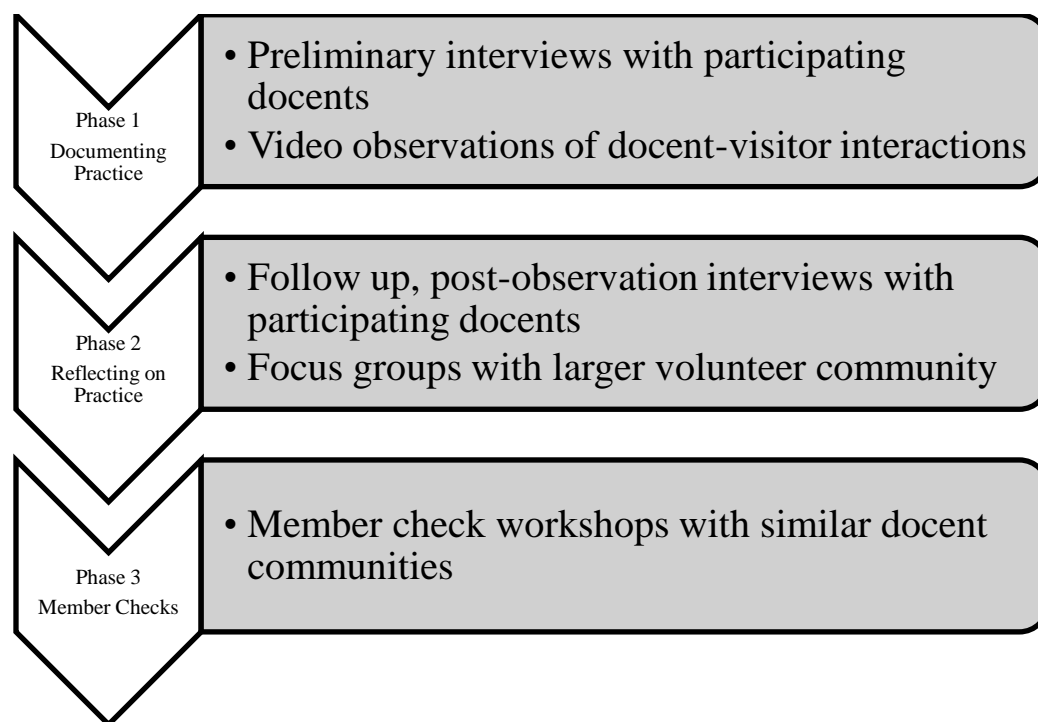


Figure 3: Steps in the Data Collection Process. The study methodology focused on documenting docent practice, having docents reflect on that practice, and member checking the outcomes with similar communities.

Docents as Reflective Participants and Practitioners

At all stages of this study, I argue that it is important to consider the value of the practices docents already engage in as well as their prior knowledge and experience of working with public audiences. Many docents spend a number of years committed to a museum setting, take both pleasure and care in learning about the needs of the visitors they serve, may already have good insight into how to effectively communicate science to their audience, and may be able to explain their goals in association with these strategies. To honor and take into account that knowledge, experience, and perspective, I tried to situate the volunteers more centrally to the research itself, rather than treating

their community as simply a component of the learning system easily studied from the outside.

The study also explored patterns/strategies in their *current* practice that emerge from a naturalistic study of their interactions with visitors, observing interpretative strategies that are common to the community of docents in question and how those strategies arose as common practice. The outcomes of such observations allowed me to document docent strategies and initiate a discussion about how their interpretive practice relates to their goals within their communities of practice as well as the learning goals and engagement in science of the visitors they interact with. In essence, the study “unpacks” current volunteer practice in relation to participating docents’ definitions of practice, obtained through observing both volunteers and the visitors they interact with, talking with docents about practice and having them reflect on that observed practice. Through each stage of the study, the docent participants were actively reflecting on their practice as well as my interpretation of that practice. This was an important design step because it moved the docents beyond simply being participants in the study to being actively reflective practitioners, allowing greater potential for study outcomes to illustrate how effective professional development and practice can be achieved in the future while honoring the goals of docents themselves as lifelong learners.

Study Site

Data collection for this study took place between August and December 2012. The site for this study was a public, non-profit marine science visitor center that is

affiliated with a university marine field research laboratory located on the Pacific coast of the state of Oregon, USA. The visitor center (VC) serves over 150,000 visitors and about 10,000 school children per year, plus over 500 scientists and educators in professional development activities. The site was suitable for this study because it is a museum setting combining both live animal and interactive science exhibits, includes a docent community, and is an already established site for research on museum learning. The volunteer program at the VC has a dedicated Volunteer Coordinator, and continuously recruits volunteers (as opposed to seasonal “pushes”) throughout the year. New volunteers receive a basic orientation with the volunteer coordinator, but are primarily expected to learn their position from shadowing other volunteers and learning about their job as they go. Volunteers participate in a regular monthly meeting for VC updates, and are offered a variety of opportunities to attend science seminars and lectures offered by the marine laboratory as well as behind the scenes tours of local research vessel ship operations and individual scientists’ labs. In 2012, the VC had 94 volunteers, with duties including exhibit interpretation, education program assistance, exhibit construction and maintenance and aquatic animal care. Eighty-three of those volunteers were “docent” volunteers, referring to the volunteer population who actively engage in exhibit interpretation and interact on the VC floor with visitors.

Participants

The participants in Phases one and two of this study were all VC docents. The study held a number of assumptions about this docent population:

- a) Docents interact with visitors to communicate science;
- b) Docents make explicit and implicit choices about the practices they use to communicate science to the public;
- c) Docent practice at the VC is a form of environmental interpretation.

For primary data collection, a sample of 25 VC volunteers was identified using theoretical sampling. Theoretical sampling was necessary to choose key informants in order to generate theory as it emerged from the study (Auerbach & Silverstein, 2003; Glaser & Strauss, 1967). The sample was chosen using criteria that identified them as docent volunteers, and classified them as “active” (i.e. regularly volunteering) under the VC volunteer requirements. The criteria were:

- a) Participant was a VC volunteer serving in a docent role.
- b) Participant had volunteered at the VC for at least 6 months, and at least once in 2012.
- c) Participant met the minimum VC expectations of working an average of 6 hours per month.

Using these criteria, the sample was generated by the VC Volunteer Coordinator using data stored on their volunteer tracking system, Volgistics. The sample represented 25 docents out of a possible 40 that matched the criteria. Each docent in the sample was invited to participate in the study, and 11 (3 male, 8 female) chose to participate, representing 28%, or roughly a third, of the possible active docent population.

Phase 1: Documenting Practice

Preliminary Interviews

While video observation described below was the primary data collection tool of the study and was intended to capture the docent action with visitors, interviewing was necessary to explore docent background, prior experience, perception of and reflection on practice, as well as gain insight into not only how docents practice the communication of science, but also why. Interviews were thus a tool to gain individual perspectives on docent practice. Interviewing can help to assess participants' thoughts and experiences (Auerbach & Silverstein, 2003; Bernard, 2006; Diamond, 1999) and therefore open-ended and/or semi-structured interviews were used for this study to capture docent perspective of how and why they employ particular interpretative practices, as well as to gather information about the docents themselves, both in terms of their life histories relevant to their role as a docent, as well as perceptions of role, experience, learning and practice at the VC. Preliminary, or pre-observation, interviews took place at the site with participating docents prior to observations of their practice. Appendix B describes the questioning procedure used during preliminary interviews.

Table 1 provides summary data on each of the participants, and highlights participants were mostly female, aged 50 years or older with a college degree.

Docent (n=11)	Years at the VC	Sex (M=3, F=8)	Age Range	Highest Education	Professional Background
Dennis	2.5	M	50-64	Undergraduate	Operations crew, coal fired power plant
Rosemary	11	F	65+	Undergraduate	IBM software development
Barry	7	M	65+	Undergraduate	Electrical engineer
Valerie	1	F	50-64	Technical Training/Associate	Retail
Tina	7	F	65+	Undergraduate	Elementary school teacher, library aide, computer programmer
Kim	1.5	F	50-64	Graduate	Clinical medical assistant, elementary school teacher, hospice volunteer services coordinator
Brenda	6	F	65+	High School Diploma or Equivalent	Marketing research, data entry, telecommunications, office manager for software company
Brian	1.5	M	65+	Graduate	Air Force, medic, industrial engineer, healthcare risk management
Jane	3	F	50-64	Graduate	Early childhood education, school nurses aid, substitute pre-school teacher
Cynthia	5.5	F	50-64	Technical training/Associate	Cook, commercial fishing, daycare, cleaning business
Ruby	5	F	65+	Undergraduate	Chemist, research and commercial labs

Video Observations

As social interaction is a fundamental part of teaching and learning amongst groups of learners in museum settings (Borun et al., 1997; Falk & Dierking, 1992;

Leinhardt et al., 2002), detailed observations of visitor and staff behaviors are key sources of data (Diamond, 1999) for highlighting the interpretative or educational practices that are being utilized by docents. Hence, observations were a logical research tool for documenting practice in this study, and commonplace in prior research on informal educators (e.g. Castle, 2001; Cox-Peterson & Ramirez, 2001; DeGregoria Kelly, 2009; Diamond, 1999; Grenier, 2011; Tran, 2007).

From my own empirical work at an aquarium, I have documented that docents can exhibit a variety of actions whilst interacting with visitors, such as *policing* by “protecting” exhibits, *teaching* by modeling how to use an exhibit, or *interpreting* by telling stories centered on exhibit topics (Dover & Rowe, 2010), findings that are consistent with those of Castle (2001) and Neill (2010). These specific types of action and the roles associated with them are important to capture as they may be indicative of the particular types of interpretative strategies docents regularly employ, the stated goals for docents interactions, or even specific perceived impacts on visitors. Additionally, the social nature of docent-visitor interactions infers the need to observe multiple interactional dynamics that require detailed observation and analysis. As a result, and despite much of the prior research around informal educators involving manual (i.e. written) observation of practice, this study was more suited to video observations as continuous video observations were necessary to capture as much of the finer detail of the social interactions as possible (Haw & Hadfield, 2011; Norris, 2004). Video observations enable a direct form of observation for the researcher and also allow for more precise analytical coding around action and discourse at the analysis stage to determine emerging

patterns in docent practice (Goldman, 2007; Norris, 2004). As a result, video observations were chosen to document docent practice as it took place within docent-visitor interactions in the VC.

Video observations in museum settings are often completed via a researcher following participants with a video camera (e.g. Ash & Lombana, 2012; Ash et al., 2012; Kisiel et al., 2009); however, cultural influences on how research participants respond to the presence of video cameras may be emphasized by the use of larger, more obvious camera equipment (Goldman, 2007; Haw & Hadfield, 2011). Therefore this study used smaller, mobile technologies equipped with their own in-built video systems. The “looxcie” headset camcorders were worn by visitor participants to monitor a “visitor-eye-view” of docent-visitor interactions. Figure 4 illustrates the Looxcie as a wearable camcorder device.



Figure 4: Looxcie Headset Camera. The “Looxcie” Bluetooth wearable headset camera was used for capturing the visitor-eye-view of interactions with docents.

The use of personal camera technologies for this study was intended to produce more seamless video observation of docent practice and, although the influence of being video recorded cannot be eliminated, make the data collection part of more natural docent-visitor interactions. This was an important feature of this study because accurately observing the interaction of docent interpretative strategies and visitor learning experiences required that experience to play out as naturally as possible in its real world setting.

Visitors thus played a role in the observational stage of this study and were in fact the primary observers. Video observations were collected by recruiting visitor participants to wear the looxcies as they entered the VC. As multigenerational family groups make up a significant majority of visitors to museum settings (Falk & Dierking, 1992), a sample of multigenerational family groups was selected as they entered the VC via purposive typical case sampling (Auerbach & Silverstein, 2003; Diamond, 1999). Every third visiting group of four persons or less entering the VC was invited to participate, and a leading adult member selected to wear the device. Each group then continued on with their visit, and the device simply recorded that visit from the wearer's perspective as they moved around the VC. Groups were explicitly asked to continue their visit as normal, and were not expected or encouraged to intentionally interact with docents. Visitors were unaware of who the docents involved in the study were at the time. All group activity, and subsequent docent interactions, were monitored and recorded. Groups returned the device at the end of their visit. Camera wearers in the group were also asked to complete an entrance survey and exit survey to determine visitor

demographic information, visit motivations, frequency of museum visits and reflections on any docent interactions they may have experienced, as well as their participation in the study. Survey outcomes helped provide a sense of the success of involving visitors as data collectors, and the level to which the process influenced their learning experiences during their visit. Throughout the data collection, entrance and exit surveys were also collected from groups who were not asked to wear a camera, so as to provide information on whether visitors who agreed to participate were in some sense different from other VC visitors who were not asked to participate. The outcomes of this aspect of the research are discussed in chapter five.

Raw video data of group visits ranged in duration of 13 minutes through one hour 23 minutes. That raw data was then filtered for clips of specific interactions involving participating docents. Video data was collected until at least 15 minutes worth of these clips had been collected per docent¹. A total of 68 visiting groups participated in collecting video data, equating to a total of 168 visitors, displayed in table 2. Mean group size was 2-3 (2.47) persons. 16 of the groups included children. Fewer groups included children because of the necessity to conduct observations during docent scheduled shifts. The shifts for the docents involved in phase one of the study took place mostly on week days when the VC was open (10am-4pm), when many school-aged children were at school and not with their families. Appendix A highlights the demographics of all visitor participants.

¹ The 15 minutes duration was determined by pilot testing to be the optimum amount of video for promoting reflective review with interview participants that would both provide robust data for reflection and also avoid overwhelming interview participants or create interview fatigue.

Table 2 Visitors Participating in Video Data Collection, n=168 total visitors			
Adults (n=146)		Children (n=22)	
Male	Female	Male	Female
63	83	11	11

Phase 2: Reflecting on Practice

Post-Observation Interviews

In this phase, docents were included in the process of generating data around explaining communicative strategies and reasoning around their observed practice. Post-observation interviews took place once individual video observations were complete to maximize the ability of the participating docents to process those experiences, whilst minimizing recollection loss. Filtered clips, which ranged from 30 seconds to 12 minutes in length, were used during these interviews. Clips were shown as a means to prompt reflection on practice as a type of stimulated recall (Ash & Lombana, 2012).

The post-observation interviews were used as an opportunity for docents to reflect individually upon observations of their own practice and discuss their reasoning about the practices observed. Docents were shown each of their clips in a process of stimulated recall, where discussion was probed around key ideas to the research:

- a) What was happening in each clip between them and the visitors;
- b) What actions the docent felt they employed to communicate with visitors;
- d) Docent reasoning about and stated intentions for their observed practice;
- e) Discussion of their reasoning for choosing such practices;

- f) How they felt after observing their clips.

Appendix C describes the procedure undertaken for these interviews in more detail.

In conjunction with the preliminary interviews, data obtained at this stage provided information around the docent decision making processes behind their observed practice, relative to their individual prior knowledge and experiences, as well as key areas for discussion in the next stage of focus groups. These interviews took place with participating docents at the site once observations had been collected. Participants who engaged in the post-observation interviews were asked if their observational footage could be used for the focus group study, and all but one participant accepted. Both preliminary and post-observation interviews were audio taped and transcribed alongside analytical notes taken by the researcher during the interviewing.

Focus Groups

Focus groups use group interaction to obtain information about participants which may not emerge in individual interviews without group dynamics (Bernard, 2006; Diamond, 1999). Exploring the group perspective of docent practice was an important design step in this study for exploring perceptions of interpretive practice in the docent community of practice. Focus groups were thus a tool for gaining the community perspective of docent practice. VC volunteers were recruited for these focus group differently from that of the observation process. Here, the entire docent pool was invited to participate in the focus group via email and staff room notification. Docents who were videotaped for observations were also included in this self-selecting sampling process in

order to encompass key informants from the docent community of practice. All VC volunteers were invited to participate in either of two focus groups in Jan 2013. Ten volunteers (2 male, 8 female) attended focus group 1, and 8 volunteers (3 male, 5 female) attended focus group 2 for a total of 18 out of 94, or 19% of the total population of volunteers. Tables 3 and 4 below describe basic information about those participants, and highlight their similarity in age, gender and education to that of the primary docent sample observed.

	Observed Docents, n=11		Focus Group 1, n=10		Focus Group 2, n=8	
Age Range	Male	Female	Male	Female	Male	Female
18-24	0	0	0	0	0	0
25-34	0	0	0	0	0	0
35-49	0	0	0	1	0	0
50-64	1	4	0	2	1	4
65+	2	4	2	5	2	1
Total	3	8	2	8	3	5

	Observed Docents, n=11		Focus Group 1, n=10		Focus Group 2, n=8	
Education Level	Male	Female	Male	Female	Male	Female
High school diploma or equivalent	0	1	0	1	0	0
Some college credit, but no degree	0	0	0	0	0	0
Technical training/associate degree	0	2	0	0	0	2
Undergraduate degree	2	3	2	3	0	2
Graduate degree	1	2	0	4	3	1
Total	3	8	2	8	3	5

Participating VC volunteers in focus groups were asked to observe video clip examples of docent practice collected in phase 1 and reflect upon the strategies and methods for communicating observed from their own experiences moving from open-ended reflection through more guided reflection. These participants were also asked similar questions to those posed in to the primary participants in the preliminary interviews (appendix B). Additionally, the focus groups were able to provide feedback on researcher interpretation of the practice as a method of member checking. The focus groups were also asked to provide their own interpretation of what was being observed as they reflected on the samples of observations provided.

The data generated in this phase provided information on the community of practice's perspective of docent practice and highlighted potential similarities and differences between researcher and docent analyses of practice. Focus groups were audio taped and transcribed alongside analytical notes taken by the researcher during the process.

Phase Three: Member Checks

Member checking was an ongoing process throughout data checking. Member checking helps establish whether the theoretical constructs generated are both understandable and coherent to the participants (Auerbach & Silverstein, 2003). Member checks took place during post-observation interviews, focus groups, during analysis and post analysis.

During Post-Observation Interviews and Focus Groups

Firstly, during post-observation interviews, I checked if docents felt the filtered clips I had showed them were a fair representation of their regular interactions with visitors in the VC and if our discussions around what was taking place in each clip were comprehensive, i.e. the data was complete and relevant to their perception of practice. All docents agreed. Secondly, in order to test the justifiability and face validity of the observational data, samples of clips shown in post-interviews were similarly checked during focus groups in phase two.

Transcription Checks

Thirdly, after all interviews were complete, primary subjects were provided with the opportunity to review the transcripts of their interviews. Here, subjects were able to check if their responses were a fair representation of their true thoughts, and could make alterations if desired. This was an important step to ensure subject comfort with the research process and more honest and/or reliable interview data.

Post Analysis

Lastly, additional workshop sessions dedicated solely for member checking purposes took place in April 2013 at two different U.S. west coast aquariums in Oregon and California. These sessions were designed to create discussion with other docent communities about whether the results of the study were recognizable and sensible in their contexts. Workshops included a short overview of the study, followed by concept

mapping activities that had participants brainstorm regular strategies they use whilst interacting with visitors, as well as reasons why they felt they implemented those strategies and where they felt they learned them. Groups then shared their thoughts, maps, and level of agreement with the study's claims, which was documented in research notes. The member checks showed that participants were able to provide similar examples of what was described by the claims in this study taking place in their settings, and participants agreed with the outcomes of the study. Findings from the member checks are discussed in chapter 5.

Analytical Framework

Approach

Given the theoretical framework for this study, the analysis of collected data was consistent with that of the grounded theoretical approach within a sociocultural perspective of learning, i.e. looking for object-oriented mediated communicative action involving docents, visitors, and science content. Analysis of the collected interview, video observation and focus group data involved analytical inductive thematic coding of transcriptions using a constant comparative approach (Glaser & Strauss, 1967) in NVivo10, in an effort to produce thematic narratives and theoretical constructs for each data set. Such a step was necessary for generating theory at each stage of the study and enabled narrative claims about docent practice to emerge from the data (Auerbach & Silverstein, 2003).

Video Analysis

Video observations (totaling 3596 minutes or approximately 60 hours), of docent practice were filtered through a number of steps in order to reduce the data. The process is illustrated in figure 5.

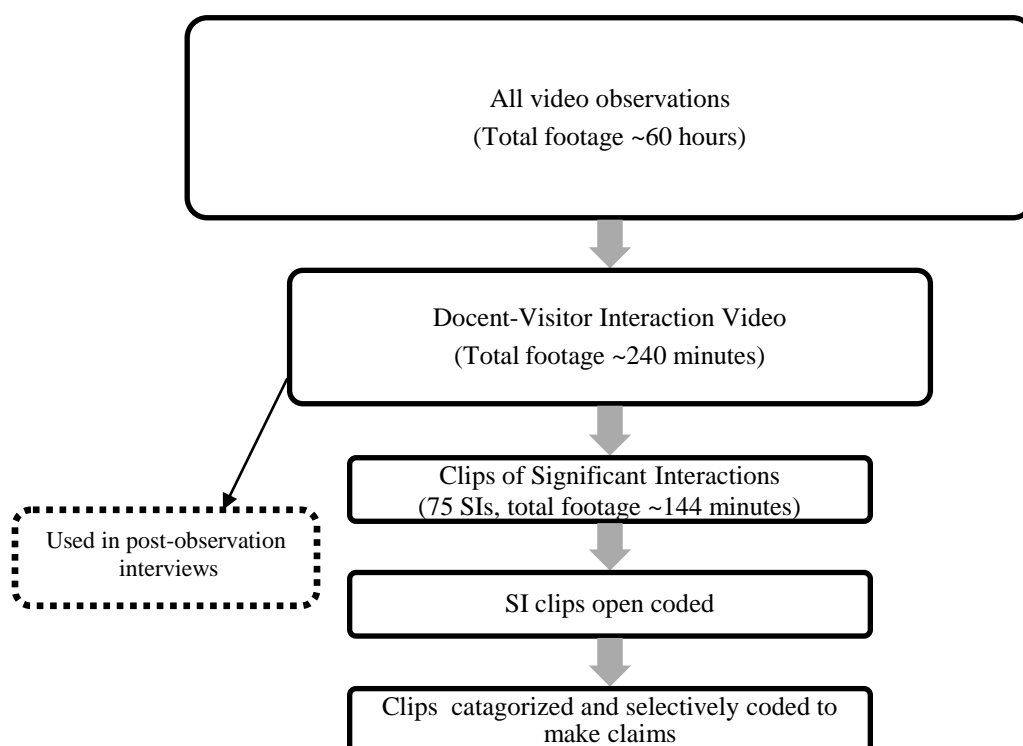


Figure 5: Process for Reducing Video Data. Video observations of primary docents were reduced to Significant Interactions using criteria modified from Ash's Significant Events (2007, 2012).

Firstly, in order to unpack the practice of participating docents only, video observations were reduced to incidences where participating docents were interacting either directly or indirectly with participating families (totaling 240 minutes, or 4 hours). Direct interactions involved participating visitors both interacting and conversing with

participating docents. Indirect interactions were those where visitors were observing conversations between participating docents and other visitors. Each of these identified interactions were then roughly transcribed to map the activities in the interaction and time coded, similarly to the procedures used by Ash (2007), Ash et al (2007), Rowe (2002) and Kisiel et al (2012).

Secondly, these reduced video clips were activity mapped and coded for significant interactions. Filtering the video at this level was completed using a modification of Ash's Significant Events (SEs) criteria (2007, 2012), used to select sustained conversational episodes. Her criteria include:

1. Recognizable beginnings and endings, generally but not always centered on one particular exhibit;
2. Sustained conversational segments that differ from the short, unsustained interactions that can precede and follow SEs;
3. Different sources of knowledge, such as distributed expertise; and
4. Inquiry strategies, such as questioning, inferring or predicting.

I modified these criteria to suit the needs of the research questions, and reduced the data to events involving specific sustained direct conversation between participating docents and visitors; direct interactions being identified as the primary source of data for this study. Similarly to the modifications made to SE criteria by Kopczak (2012), and in light of Bachman's (2011) video filtering processes highlighting home school families' STEM-centered lessons, I added an additional criteria to focus events on relevant docent-visitor interactions involving conversation in the context of science and eliminated

criteria 3 and 4 to maximize the possibility of finding such discourse in the relevant interactions. In line with science conversations taking place at touch tank exhibits in science centers discussed by Kisiel & Rowe (2012; 2009; 2012), interactions involving conversation within the context of science referred to both spoken and non-spoken (e.g. gesture, eye gaze, body language) conversational elements where science-related talk, scientific thinking and scientific reasoning were evident. The elimination of criteria 3 and 4 was necessary in a grounded theory approach where direct interactions may not have involved different sources of knowledge and/or inquiry strategies. “Significant Interactions” (SIs) were therefore identified using the modified criteria below:

1. Primary video involving participating visitor groups and participating docents directly interacting with each other
2. Interactions with recognizable beginnings and endings, not always centered on particular exhibits
3. Sustained conversational segments that differ from short, unsustained interactions, which can precede or follow significant interactions
4. Interactions involving conversation within the context of science, defined where science-related talk, scientific thinking and scientific reasoning were evident

Once identified, SIs were then fully transcribed in preparation for coding (144 minutes). SIs ranged from 51 seconds to eight minutes in length; the majority of SIs were between one to two minutes long; mean SI length was 115 seconds.

For the last stage of video data reduction, the SIs were thematically coded, relative to the mediated action that was taking place between docents and visitors. Here,

emerging themes were generated based on that mediated action, focusing on the objects, tools and discourse associated with such action. Codes were categorized, and selected to identify claims about the data using a constant comparative approach as described above.

Interview and Focus Group Analysis

Preliminary and post-observation interviews, as well as focus groups were coded from transcriptions similarly to that of the SI video clips, but in response to the mediated action observed. Here, interviews and focus groups were coded for repeating themes explaining the identified practice and thus analyzed to identify reasoning and potential sources of learning in relation to the coded action of the emergent docent practice. Where responses to more structured questioning were present, these data sets were also coded in vivo to the questions asked, e.g. role, responsibilities. Research notes on participant comments gathered during member checks were treated similarly to the raw data, except with the focus of looking for similarity between repeating ideas the claims made by the study and those discussed by member check participants.

Trustworthiness

Throughout both data collection and data analysis, a number of steps were taken to monitor the trustworthiness of the data and outcomes. These steps included analytical field notes, peer review, triangulation and member checking.

Analytical Field Notes

Analytical field notes were taken both during and after each set of observations and interviews to maintain data collection procedure consistency, as well as keep a record of events and monitor researcher subjectivity and potentially influential events (for example, weather conditions were often associated with changes in visitor numbers during recruitment).

Peer Review of Coding

Coding reliability was ensured through peer review of coding. In line with the grounded theory framework, codes, although centered on mediated action, were emergent from the data, and videos were coded until data saturation was reached, that is until no new codes emerged. Once this initial step of coding was complete, the codebook was reviewed by an advisor, and suggestions for collapsing or categorizing codes were made. After categorization, and before final claims were made, my codebook and a sample of SIs with no coding were provided to two colleagues for review. Coding was matched strongly at 83%, and my colleagues provided suggestions for code revision. Final claims were built after modifications to the coding based on suggestions were made. The strong correlation of code checks during peer reviews suggests a high reliability of emergent coding.

Triangulation of Data Sources

A triangulation effort was made to confirm how docents enacted their practice during observations in light of how they described and explained the presence of that practice during their interactions with visitors during interviews. Here, the outcomes of both pre and post-interviews allowed me to review coding of the actions taking in place as I coded, whereby if actions were not taking place that docents reported they invoked or participated in, I would review the video data once again in case I had overlooked such events. In this way I was able to identify and document actions that I may not have noted as important myself.

Member Checks

Member checks were completed as described in phase three above. Member checks were an ongoing process throughout the study to check both the accuracy of the data as a representation of real world action and beliefs, and whether outcomes made sense to both participants and similar communities to ensure data quality and outcome coherence. As previously, explained, member checks were completed via:

- Post-observation interviews and focus groups
- Transcription checks
- Post-analysis workshops with similar communities

CHAPTER IV

RESULTS & DISCUSSION

This chapter describes the claims and overarching themes generated from repeating ideas centered on docent mediated action aligned with moments of communicating science found in the thematic analysis of the video observations and explains those actions via triangulation with interview and focus group data. In this way, the chapter is organized around large scale emerging themes rather than a detailed description of the level of action observed, or case study presentations of each of the 11 docents involved. Such an approach is more appropriate as a means to present patterns in the data set as a whole, rather than ethnographically, in an attempt to strike a balance between a participant-centered grounded approach and a research-centered analytical approach to unpacking docent practice. In this way, the outcomes can be more pragmatic. A pragmatic approach is appropriate for the level of analysis in this study as such outcomes are of more use and potentially more interest to the people in the field (i.e. docents, volunteer managers) in terms of the study's possible implications for the future. If the results presented are to be useful to the field, they must also be approachable to the field, hence the necessity to find middle ground in the presentation of findings. Throughout the study I was also mindful of methods of data collection being both approachable and transparent in an effort to exemplify research and evaluation tools for the field and as an additional means to promote interest in the field of study.

Four Claims about Docent Practice

Overview of the Action in the Significant Interactions

Analysis of the video data showed that significant interactions (SIs) could be identified in six key areas of the visitor center (VC) including, the sea star touch tank, flat fish touch tank, anemone touch tank, “six-rack” fish tanks, the octopus tank, and the tsunami wave tank. Figure 6 provides video snapshots from participant data of observations in these key areas.



Figure 6: Key Areas of Interaction in the Visitor Center. Snapshots highlight the six key areas of interaction observed in this study (1) Sea star touch tank, (2) flat fish touch tank, (3) anemone touch tank, (4) “six-rack” fish tanks, (5) octopus tank, and (6) tsunami wave tank.

Video observations of participating docents also took place in other areas of the visitor center; however, none of the interactions in these areas met the criteria for being listed as an SI. A total of 75 SI were identified and coded for repeating actions. Table 5 lists the number of significant interactions taking place at each of the six exhibit areas.

The number of SIs taking place at touch-tank locations was highly weighted. This was expected as VC docents are required to staff the touch tank areas at all times during their shift. As a result, visitors were more likely to make contact with docents in these locations than in other exhibit areas. Interestingly, and despite this location also requiring constant docent staffing and demonstrating in the video a good deal of visitor/docent interaction, no significant interactions were found to occur at the front desk location of the visitor center. Such an outcome suggests that science discourse between docents and visitors is more likely to occur in exhibit areas than at the front desk in the VC, which was expected where object-orientated activity too place. During interviews, all of the docents agreed that they were most likely to interact with visitors at the front desk and touch tanks. Table 6 highlights the repeating actions found in those SIs and their frequency, as well as a mean number of incidences of each action per SI.

Location	# of SIs
Sea Star Touch Tank	36
Anemone Touch Tank	16
Octopus Tank	12
Flat Fish Touch Tank	6
“Six rank” Fish Tanks	3
Tsunami Wave Tank	2
Total	75

Docent Action	Frequency (# of incidences)	Mean # of incidences per SI
Provided a “snippet” of information related to the conversation at hand	298	3.97
Answered visitor question	114	1.52
Pointed to an item	92	1.23
Identified an animal	82	1.09
Asked visitor a question	74	0.99
Encouraged visitor to touch an animal	44	0.59
Used humor	40	0.53
Shared a story or personal experience	38	0.51
Encouraged visitor to look at item (e.g. animal)	35	0.47
Explained phenomena, or why something happened	35	0.47
Gestured with hands to help explain an item or phenomena	32	0.43
Located an animal for visitor to see	23	0.31
Referred to a biofact during interaction	19	0.25
Invited visitor to participate in “hook” activity	16	0.21
Touched an animal themselves	16	0.21
Modeled intended behavior	15	0.20
Provided visitor with instructions to make something happen (e.g. animal response)	14	0.19
Used an analogy to help explain an item or phenomena	11	0.15
Pretended not to know the answer to a question (encouraging visitor speculation)	9	0.12
Enforced/reminded rules about touching animals	7	0.09
Looked up information in resource folder	3	0.04

Here, the mean for each action is given in order to provide a sense of how often the actions were likely to occur per SI, as an alternative to a probability which would not be an appropriate calculation as each action was not independent of each other action (i.e., one action could very well be the result of another rather than an independent action). Providing “snippets” of content information, answering visitor questions, pointing to items, identifying animals and asking visitors questions were among the most frequent actions documented. Often these overlap as docents point while providing a snippet of information about an animal as part of asking or answering a question. It is, therefore, somewhat misleading to think of them as discreet actions. Instead, they are more usefully considered as suites of actions that help docents reach particular goals in a multimodal way, as the examples illustrating each claim will make clear.

How the Claims are Presented

From the combined analysis of the video observations, pre and post interviews, and focus groups, four generalized claims about docent practice within this particular community of practice emerged. The claims themselves create a theory of docent practice by illustrating the action observed and providing explanations of that practice and potential sources of learning from the docents’ perspective. In essence, the claims attempt to make the docents’ implicit theories about their practice explicit. Each claim has underlying subthemes, which are described in more detail as a means for discussion in the remainder of the chapter. The four claims are:

1. Docents see themselves as promoting visitor learning

- a. Docents make bids to engage visitors using museum objects
- b. Docents encourage visitors to interact with and make more detailed observations about objects
- c. Docents believe visitors learn science in the museum and that they play a role in that process by both creating meaningful experiences and imparting stewardship

2. Docents encourage conversation around science as they mediate interactions with museum objects

- a. Docents communicate science via snippets of content information
- b. Docents use snippets of information to ask and answer questions and identify objects of shared focus
- c. Docents facilitate conversations about science based on visitor patterns and using a shared repertoire of practice and information

3. Docent roles can be conflicting and require balance

- a. Docents believe they must strike a balance between facilitating visitor learning and protecting exhibits
- b. Docents are also concerned with balancing people skills and being a scientific resource
- c. Docents use their prior knowledge and experiences to fulfill their roles

4. Docents utilize tools of interpretation to help build personally meaningful experiences for visitors

- a. Docents use analogies and gestures to explain phenomena

- b. Docents also use humor and storytelling to make connections and provide context to scientific content.

Each claim is explored in the following sections via their corresponding sub themes using examples from the data. Samples of or quotes from transcripts are used to illustrate those examples. In video transcripts, A = Adult, C = Child, M = Male and F = Female. In video and interview transcripts docents are named by their pseudonyms. In focus group examples, FGD = focus group docent. Additionally, in all transcripts spoken discourse is represented in regular font and type while gestures and other actions are bracketed (i.e., [points to sea star]). After each claim is described, a broader summary of the theory generated in the larger context of the field is also provided. As this is an interpretive approach, these are certainly not the only claims that can be made from the data. However, they are the most salient in terms of answering the research questions and unpacking docent practice at this level.

Claim 1: Docents See Themselves as Promoting Visitor Learning Through Encouraging New Experiences

A. Docents make bids to engage visitors using objects

Observations of the docents showed that interpretive activities docents facilitate in the museum setting were poised towards encouraging visitors to have new experiences. Docents also talk about this in terms of desiring visitors to learn new things. A new experience in this sense was the notion of encouraging visitors to learn, try or see something new in the context of science offered in the museum setting.

“...my other goal here is that everybody who comes in, I want them to leave knowing something that they did not know when they came in the door. (Dennis, preliminary interview)

“...as I told you originally my goal is to, whoever comes in, they go out learning at least one thing” (Dennis, post interview)

In Dennis’ examples above, he is explicit about his goal for visitors leaving the visitor center having learned at least one new thing both in his preliminary and post observation interviews. Learning that new thing in this regard was brought about by encouraging visitors to have new experiences, to which Barry below is attempting to facilitate:

Transcript 3b, Barry is having visitors touch and compare sea stars

Barry: The leather stars, which are the red guys here [he points]. Have you ever touched a sea star?

AF: Like this one? No, I don't think so

Barry: Ok, well touch a sea star, this pink one [he touches it]. Just feel what it feels like external. You can't possibly hurt him, so...

AF: [she touches] Oh he's like moved a little bit, with just a light touch, he's barely hanging on there

AM: Oh

Barry: Now, touch the red one [he points at it, AF touches]

AF: Oh, so soft

Barry: So...

AM: Wow

Barry: Because it's so soft, it can't be in a tide pool because birds would really just peck him

AM: Yeah

Barry: Unlike this one with really tough skin [points to pink star]

AM: Yeah

In this video example, Barry is encouraging visitors to touch sea stars for the first time by having those visitors compare different species. He simultaneously points to and touches the animals he wishes the visitors to touch (i.e. modeling behavior), to which they respond. He also provides an explanation of why these differences are present. Here, he

is encouraging the visitors to both learn new information and do new things at the exhibit. Barry's example highlights the notion of docents using tangible opportunities to engage visitors in new experiences and open conversations around science.

“Hook” activities (e.g., mini-experiments highlighting an animal's texture or behavior, a word docents use themselves), asking provocative questions, pointing out items to observe (such as tide pool animals), and encouraging visitors to touch animals were all actions docents used, often in unison, to encourage engagement with an exhibit. As with the Barry example above, such action often involved docents asking visitors to compare the texture of multiple tide pool animals and consider their similarities and differences. In a similar example below, Jane is encouraging a child to observe the difference in texture between sea stars.

Transcript 9b, Jane at sea star touch tank

[CM is touching a pink sea star]

Jane: Ok, try this one [she points to a leather star]. Tell me if there's a difference

CM: Yeah, it's slimy

Jane: Is it soft?

CM: Yeah

Jane: That's a leather sea star

[AF touches the leather star; CM goes back touching a pink star]

Jane: Do you know why there might be a difference between hard and soft?

CM: No

Jane: No? Because of where they live [pointing at the leather star]. These guys live deep in the ocean, where this guy (pointing at pink star) lives closer to the shore and he has to be hard because of the waves and the storms.

[CM continues to touch the stars]

Here, Jane is using the same approach of touching and pointing to encourage interaction with the animals, and has an alternative explanation for the phenomena. In this case, Jane was attempting to expand on the child's experience touching the sea stars, as opposed to

initiating the touching in Barry's example. Both examples illustrate docents attempting to help visitors notice something new.

Docents explained pointing out these comparisons in terms of promoting an observation of particular animals, or an animal's adaption (specific science content in this case), which they believed the visitor would otherwise bypass or not notice. Docents were explicit about this in focus group 2;

“...other thing is to make [the visitors] aware [the animals] are there and to know, so then they can start looking for them and then all of a sudden they will see them. (Docent, focus group 2)

And suggested that this was an ongoing issue at other exhibits, not just at the touch tanks:

“People don't realize that particularly in a tide pool setting, the longer you look the more things you'll see. They are unlikely to stay put and look, and that is the case of the touch tanks too. Well, watch, you show 'em the tube worm and there he is, particularly the smaller things if they're not pointed out, they miss. That's very much the case with the pipefish. You know, I can't tell you how many hundreds of people look at [the six rack fish tank] and all they see is the grass and I stop 'em and say 'did you see our little pipefish?' and they look blank and I take 'em over and show 'em. 'Oh, those are really neat'. But they need somebody to point things out that they go by” (Docent, focus group 2)

B. Docents encourage visitors to interact with and make more detailed observations of objects

The focus group excerpt above also exemplifies how docents express their basic belief that visitors will miss opportunities if an animal is not overly obvious on first look, suggesting that without the docents' assistance, many of the animals (objects) would go unnoticed and underexplored by the visitors. In essence, docents are concerned that visitors could miss out on things the docents' value and believe visitors would be interested in. Throughout the video data and interview transcripts, docents were both

observed and themselves reported making bids to engage the visitors in the exhibits at the VC so that visitors would not overlook or simply miss out on opportunities for these new, meaningful learning experiences. They strove for visitors to become interested in the opportunities presented to them, and noted that pointing out items of interest to visitors (such as animals hidden in touch tanks) was important so that opportunities were not lost. In Jane's conversation below, she explains that she attempts to point out objects that are hidden.

“A lot of times, like I said, if you don't point [the brittle star] out people won't see because, especially over this tank with all the sea stars, he hides between them. So, yes, I do try and point something out in one of the tanks...” (Jane, post interview)

Such an idea is supported by observations of the visitors themselves; where during similar interactions at the touch tanks visitors noted that without the docent, they would not have noticed an animal in their vicinity.

Transcript 3b, Barry is showing visitors fish in the flat fish tank

Barry: [pointing] The ones out there are the flounder

AF: Oh yeah! Oh my gosh

AM: Oh my goodness:

AF: Thank you, I didn't even see!

AM: It's a flounder

AF: I didn't think there was much in here

Transcript 5i, Tina is talking with visitors at the anemone tank

Tina: [moving up to the upper pool of the anemone tank] We have a little fish over here [she points by placing her finger in the water]

AF: [Looking closer at the tank] Oh I see him laying there, he's all blending in

Tina: [continuing to point] He's called a plain fish

AM: Oh my! I never would have noticed it

Tina: It usually is latched on to the side of the wall

In the examples above, both Barry and Tina point out fish that are camouflaged into the rocks of the touch tank, which the visitors are surprised to see. The visitors are both thankful and happy the fish was pointed out to them. In this regard, there is evidence that the visitors value those opportunities to observe something they may have missed as much as the docents do.

Another example of docents opening opportunities for new visitor experiences involves a hook activity where the docent asks a visitor to experiment with the reaction of a leather sea star on contact. Here, visitors were asked to rub the sea star with two fingers to note any changes in texture, and if they could smell anything secreted by the star after touching.

Transcript 1e, Dennis is facilitating activity with leather star

[AF touching leather sea star, AM watching AF touch]

Dennis: Now the water in here's a little chilly. We pump it right in from the ocean...keep going [he motions to the leather star]...we filter out all the logs, twigs and frogs and run it through the tank, that's what makes it so easy to maintain all these animals. The interesting thing is it also goes through all the tanks and our research facility in the back, so when they're researching diseases we have to clean that water really good before we put it back in the ocean.

AM1: Hmm

AF1: Aww yeah

Dennis: Is it getting smoother for you?

AF: Erm, I dunno not particularly

Dennis: No it's not particularly? Ok.

AF: Well, maybe I guess so, yeah

Dennis: Maybe? Ok. Well what I'm gonna have you do, it sounds really stupid, but bear with me, I want you to smell your fingers and tell me what you smell

AM: Uh oh

AF: It feels so smooth now that I don't know if I want to

AM laughs

AF: I don't think I smell anything

Dennis: Do you smell garlic?

AM: Ohhh

AF: No

Dennis: Ok. You're one of those three out the five that do not. I don't either. 2 out of 5 smell garlic when they do that [gestures with hands], I've had them go "oohh garlic!" [He laughs]

AM: Really?

Dennis: Really

Here, Dennis is implying the sea star will do something interesting by asking provocative questions that spawn a reaction from the visitor, even if it is not the reaction he expects her to have. The visitor does not notice the expected outcome, but is interacting with the sea star regardless, and Dennis is still able to provide some relevant information about the water in the exhibit whilst the visitor was rubbing the sea star. In this regard, and similar to the sea star comparison examples, the docents are able to communicate relevant scientific information as they engage a visitor in a tactile activity. The activity therefore is itself a gateway to a larger conversation around science.

A final example of opening opportunities for engagement was another "hook" activity, the sea urchin "hug", a practice nearly ubiquitous among participating docents at the touch tank and reported in interviews, focus groups and member checks to be very wide spread as a practice. For a sea urchin hug, docents asked visitors to place a finger between the spines of a purple urchin and watch its reaction. Figure 7 provides a snapshot of a docent demonstrating a sea urchin hug.



Figure 7: A Docent Demonstrates a Sea Urchin “Hug”. The sea urchin hug is an example of a mini-activity used by docents to “hook” their engagement with an exhibit.

The transcript below is taken from an interaction involving a sea urchin hug. Here Kim is not only inviting the visitor to participate in the hug, but also demonstrating it herself:

Transcript 6a, Kim facilitates an urchin hug

AM: So what are these spiky ones here?

Kim: Those are sea urchins

AM: Hmm

Kim: And if you put your finger down inside of those...

AM: Oh yeah I see that [touches]

Kim: ...carefully [demonstrates by touching with one finger between spines] you'll get a little hug.

AM [holding finger in place]

AM: Oh really? [The urchin spines close around his fingers] Yeah you do

Kim: It's probably trying to see...

AM: Uh huh

Kim: ...if you're good to eat, or if you are a predator or whatever

AM: Wow

In this transcript, AM opens with a question. Kim answers it succinctly by naming the animal (“Those are sea urchins”) and with only a small pause goes on to suggest a procedure (the hook) that she in fact also begins simultaneously to demonstrate by

modeling how to touch the animal to create the desired outcome. After a pause where AM mimics Kim's touch of the animal, Kim suggests a particular biological interpretation (a snippet of content information) for the animal's observed response. In this manner, she extends the engagement initiated by AM's question by using a hook in the form of a suggested activity that will result in something AM might otherwise not experience. She then further extends the engagement with that snippet of information.

Visitors weren't always overly keen to accept the invitation to the urchin hug, many expressing an expectation that it would hurt them. However, from the interviews and focus groups, the urchin hug was an activity that all the docents knew, had used and believed to be effective for engagement.

Transcript Focus Group 1, conversation around urchin hugs

Researcher Why is the sea urchin [hug] a popular thing to do?

FCD1: It's interacting with them.

FCD2: It looks like something you never want to touch and it will hurt you.

That's one of the reasons. So I usually tell people to think they're like toothpicks, wiggle your finger. And then it's like 'oh, here's this intimidating looking organism and look it's giving me a hug'.

FCD3: It's an animal they can actually interact with, you can pet the anemones and you know, and I ask them about the tentacles and do they know why they're stick and a couple of people will talk about some character on SpongeBob. [Other docents: Ya.] And, uh, but the sea urchin actually moves.

Researcher: So when you get a reaction out of the public then, does that make you happy?

Docents together: Oh yes. Ya. Absolutely. Sure."

In this regard, the urchin hug can be considered to be part of a common repertoire of practice, a key feature of the existence of a community of practice according to Lave and Wenger (2000). It being a common repertoire was discussed explicitly in focus group 2.

Transcript Focus Group2, discussing the urchin hug

FGD1: I find it interesting, when I first came here we did the touching the urchins, but that hug terminology wasn't there so I wonder who thought that idea out.

FGD2: I don't know.

FGD3: I don't think people said that when I first started either.

Researcher: Everyone at the [local] aquarium says it too.

FGD4: I was taught it by some little kids that came in here and they had learned it from somebody in the back [by the aquarists]

Researcher: Where did you pick [the urchin hug] up?

FGD1: It was shown to me, I don't know.

FGD3: Like you, I knew what happens when you put your finger there but I have never heard of the term [hug]. I wasn't familiar with that. I think it's a good idea.

FGD4: It's a neat one to use with little kids. You know, you get a hug from the urchin.

FGD2: And [another docent who also feeds the animals] taught me so... she's my feeder teacher.

In this transcript, the docents explain that the urchin hug had been learned over the years working with the visitors and from peers, although it had not always been known as a “hug” in this particular community. As a result, this example of shared practice had been learned by the docents from both on-the-job experience and from the communities of practice they are part of.

Although not exclusively discussed in the interviews, the same could be said for the other activities described above based on them being repeatedly observed being used by different docents, such as the sea star comparison, and suggests that docents share a common repertoire based on what they feel is useful and successful for opening opportunities for visitors to engage with science, and that they learn these generally from each other, trying them out with visitors and keeping the ones that seem to promote engagement that leads to noticing something that might otherwise be overlooked or not experienced.

All of these examples discussed so far highlight the action of the docent attempting to bring something to the visitor's attention. In line with these actions, and as demonstrated with Barry, Jane and Kim above, many of the associated interactions also included docents modeling the behavior they were trying to encourage (e.g. demonstrating placing their own finger in between the spines of an urchin while encouraging visitors to receive an urchin hug). In essence, docent action at these times was orientated towards encouraging new experiences through encouraging more detailed observation of and physical interaction with the exhibit. In turn, these new experiences are valued by the docents as opportunities for meaningful learning that visitors might miss out on their own.

During interviews, docents confirmed these actions as part of their everyday practice and explained them in terms of initiating engagement. They explained their desire to move visitors towards new experiences, and perhaps even out of their comfort zone. Dennis and Rosemary both talk about this below, using the example of the touch tanks and the octopus.

“...[at the touch tanks] when we first start you need to, you need to get people involved for the most part they're not going to do it on their own. So whatever you can do to reach out and get them to come in and touch things and whatever, that's what you do and this has worked fairly well...A lot of people who come by touch a sea star and ok, that's fine and they go away and so you need to come up with something to draw them in. It's a hook, and once you get 'em hooked then it just goes, it's just wide open from there”. (Dennis, post-observation interview)

“I think without someone pointing [the octopus] out, 'oh, he's sleeping over here', then they are very likely just to walk by and not appreciate the chance to look at the octopus.” (Rosemary, post-observation interview)

C. Docents believe visitors learn science in the museum and they play a role in that process by both creating meaningful experiences and imparting stewardship

In the interviews and focus group discussions, participants expressed a desire to help visitors they encounter have meaningful learning experiences during a visit, and more specifically, encourage those experiences. Here, docents view meaningful learning experiences as those that involve trying and learning something new in the context of the museum. As Dennis put it,

“...my other goal here is that, um, everybody who comes in, I want them to leave knowing something that they did not know when they came in the door. Whether it be at the touch tank, the octopus, whatever, whatever I can enlighten them on.”
(Dennis, preliminary interview)

These beliefs entail a specific set of ideas about the museum as an educational space and set of learning opportunities that might or might not get activated by visitors without the docents’ guidance. As Ruby put it,

“I guess I feel that [the VC] is a teaching place. You know, the displays are set up to be informative, um, to teach people things about the ocean and the animals and everything so, um, it seems like that’s what we should do. (Ruby, preliminary interview)

In particular, docents believe that visitors are learning science content from their experiences in the museum:

“So I think they learn...they learn about the research from [the marine laboratory], from a lot of those projects which is great you know, understanding that relationship. They also, um, they really learn about I think the variety of creatures and how strange they are, how different, how unlike some of the ocean creatures really are, it’s kind of nice.” (Kim, preliminary interview)

And docents are explicit that they play a role in that process.

“Well you’re teaching them things that they don’t know. Most of them, a few of them do but most of them are very, I mean they’re unaware that there’s things that are like rocks that they really can’t visually see but are there, they don’t watch for them and uh the way they treat things. They, they don’t realize oh my gosh, you pull a sea star off the rock you’re hurting it. We don’t think of things that way, a lot of them don’t, some of them do. It’s enjoyable sometimes when you tell a child, he’ll turn right around and feed that information to a parent and it’s you know, he’ll come over and then he tells the parent what you’ve told him, which is always kind of refreshing, that means that somebody learned it.” (Brenda, preliminary interview)

Such an outcome is important because a docent actually believing that they fulfill their own expectations is indicative of them believing that their practices are effective. In addition, Brenda’s quote above suggests that docents value the opportunity to share their enthusiasm for science and the [marine] environment with visitors. They believe visitors should be exposed to science and that they have a responsibility to encourage care and compassion for the environment in terms of protecting animals. In the example from focus group 1 below, the docents express concern about visitors appreciating the animals and the environment they live in as more informed citizens.

Transcript Focus Group 1, discussing stewardship

FGD1: I hope people will leave feeling excited about what they’ve seen and encourage them to want to learn more and really appreciate the incredible surroundings.

FGD2: I think there’s an ethic I would like to teach dealing with non-human creatures. These, for example, you have to be afraid of not only what the critter might do with you but you need to watch out that you may not contaminate an anemone with your germs and that’s part of the way you might treat it. There are other things you don’t want to do not to harm whatever creature it is.

FGD3: And perhaps imparting a little bit of stewardship, maybe further down the line if there are issues that come up on ballots or discussion about the ocean or research that’s needed, they would have some sense and experience.

Docents see imparting stewardship not just simply as part of their role, but also their preferences as a volunteer, an idea exemplified by a docent in focus group 2 talking about inspiring visitors to help clear marine debris after conversation in the VC.

“And what I like, what helps me feel like I’m making a contribution is when I get some indication that the [visitor] experience here is, uh, goes outside the four walls. So for instance, I really like this, uh, you could pick up a tsunami debris bag and that tells me that they’re reading and they’re moved by something that they can do and, uh, they come up to the appropriate place and ask for a bag so I like that.” (Docent, focus group 2)

This suggests that docents perceive that communicating conservation messages is part of creating meaningful learning experiences in this setting, a concept familiar to that of environmental interpretation (Ham, 1992). As examples, again, Kim and Brenda below are explicit about their roles in guiding visitors to have meaningful learning experiences in the context of conservation:

“I think my role is to spark people’s interest and curiosity in the marine world and to realize, uh, how much of it is unexplored and how we are interested in space and aliens and all this other stuff and we really have no idea what’s under our feet in we’re on a boat [laughs]. But it’s mostly I’d like to spark curiosity so that people will want more.” (Kim, preliminary interview)

“...they learn how to be more respectful of the animals in your tide pools when they go out and then the main thing is you know they, people don’t realize sometimes that these are animals and they’re not just pretty things in the water and they’re usually kind of surprised sometimes you know, that the anemones are an animal. They really don’t put them that way so, I don’t know, that’s kind of the main thing, just that they have more respect for what’s out there in the ocean.”[Brenda]

As the two quotes indicate, docents see themselves not just as providing opportunities for learning science content, but also changing attitudes to the natural world

and creating further motivation, all key features of learning in museum settings (National Research Council, 2009) .

Summary of Theory Generated in Claim 1

Docents view teaching in the museum as opportunities to spark interest with these new experiences. Practices are chosen to engage visitors in these experiences. Docents choose to highlight these experiences as they believe they are reasons to be engaged.

Claim 2: Docents Encourage Conversation around Science as they Mediate Visitor Interactions with Objects

A. Docents communicate science via snippets of content information

One of the most frequent actions to occur during interactions was coded as docents providing visitors with “snippets” of content information. Here, I defined snippets as individual facts, what are often called “factoids” in everyday language. As I mentioned in claim 1, these small units of information seem to serve a variety of purposes for docents as they relay them to visitors in relation to the topic of conversation around an exhibit. Overall, examples of snippets ranged from numerical facts, to small “pieces” of information about an animal’s anatomy or adaptation. 89% of snippets were associated with the animals on display in the VC, which might be expected as the majority of significant interactions were located at live exhibits. In large part, docents interjected snippets into conversations wherever possible as 92% of SIs involved a docent providing at least one snippet of information to visitors. As a result, the data suggests that snippets

of information are important to decent interactions with visitors in the context of communicating science.

B. Docents use snippets of information to ask and answer questions, and identify shared objects of focus

Snippets were applied to interactions in a variety of ways. In some cases, for example, snippets were used as answers to questions:

Transcript 1m, Dennis talking to visitor about sea stars

AM: Those are really interesting creatures. How long can they survive outside of water? Like when the, you know, when the tidal pools, you see them on rocks

Dennis: Sea stars, those pink ones. They're good for about 45 hours

AM: Oh, ok

Dennis: The other ones about 15. They have to be able to stay out of water enough but when the tide will...

AM: So can't come back and forth, yeah

Dennis: So they have to be able to, you know, endure and last

AM: And the same would be with the anemones as well?

Dennis: Pretty much yeah

AM: Wow

Dennis: Typically you won't see an anemone where the tide goes completely out. You will see them in a tide pool with a lot less, but not hanging on a rock where it goes out for 12 hours

AM: Yeah, huh.

In this example, Dennis answers the visitor's questions about sea star survival out of water by providing information on differences in survival times between the different sea stars. The factual answer then leads to further questioning around sea star movement and drawing similarities with anemones. In essence, the snippet response creates opportunity for deeper and longer engagement of the visitor by spurring further questions and further snippets.

Snippets of information were also used by the docents as follow up information related to a visitor's observation of an animal. In the example below, Tina responds to a group's reaction to seeing the octopus moving in the tank.

Transcript 5h, Tina talks about octopus intelligence

[AF & AM goes over to the octopus tank where Tina is located; Squirt the octopus has his suckers up against the glass and is moving around the tank where visitors are watching him]

AM: They're smart

Tina: Yeah they're very wonderful they have the intelligence of a cat

AF: Of a cat?

Tina: Yes. They can take a treat out of a container.

AM: Oh look at him. Oh man, what a head

AF: A treat out of the container, ahh wow

[AM is leaning down to look at octopus and reacting.]

Tina: Well that's his mantle

Here, the male visitor seems quite taken with the octopus and comments about how smart he is (presumably because he is responding to the attention he is getting from the visitors). Tina responds with a relevant snippet regarding how intelligent the octopus is, and provides an example (taking a treat out of a container). She repeats this process in response to the visitor's remark about the octopus' head, providing the appropriate snippet by naming the head part (mantle) of the octopus' body. In this case, the snippet is used to extend the experience beyond the visitors' observations, and is responsive to the visitors' specific observations.

Lastly, snippets were observed being used as hooks themselves. Below, Barry attempts to engage visitors in deeper conversation using a snippet.

Transcript 3b, Barry attempting to engage at sea star tank

[AM and AF are casually observing the sea star without touching, quietly talking between themselves, Barry, seemingly noticing, approaches them from behind]

Barry: These guys can live a long time [pointing]; I mean a sea star can live 50 years

AM: Wow. 50 years?
 AF: 50? Wow
 Barry: Yeah
 AM: Geez.
 AF: Look how that one's all puffed up [points], in between
 Barry: [pointing to the same star] Well, it's because he's probably eating
 AF: Eating, yeah

Barry uses the snippet in this case to initiate an interaction with the visitors as they begin to observe what is in the tank. The snippet is enough to spark a surprised reaction from the visitors, which continues into further observations of the sea stars on behalf of the visitors. In this case, the snippet invokes a visitor reaction.

Across the videos, there are similar examples of snippets being used by docents to deliver information in an attempt to be responsive to visitor interests and mediate their interaction with an object (i.e. animal) in a meaningful way. In this regard, the docents are attempting to extend engagement with the exhibit. Such a notion is exemplified by docents being opportunistic with their content delivery. Here, and similarly to Tina's example above, Brenda responds to verbalized visitor observations about an object.

Transcript 7a, Brenda talks with visitors about octopus adaptations
 AF: [picking up a biofact off the back of the octopus tank] Oh that's a Dungeness crab!
 Brenda: Yeah the problem is when crab is [the octopus'] main diet
 AF: Uh huh, ok
 Brenda: What they do is they take the beak and they jab the crab and they put a toxin in
 AF: Oh, ok
 Brenda: And the toxin actually liquefies them
 AF: Ooo!
 AM: Oh

Brenda in this case provides a rather gory snippet relevant to the visitor observation of the biofact that itself provokes an emotional response, similar to that of Barry's example

above. Further engagement with the octopus tank and surrounding material and ideas is therefore encouraged by providing talking points for visitors to continue to ask questions around. Docents were most often observed using snippets in response to visitor emotional responses (e.g. “wow”, “ooh”, “that’s amazing!”) to animals. Another example sees Rosemary respond to a visitor’s reaction to a sunflower sea star:

Transcript 2a, Rosemary talks to a visitor about sunflower stars

AF2: [Pointing at sunflower sea star in the octopus tank] Ah, pretty!

Rosemary: [Approaching AF2] Those sea stars are the biggest kind, look at all those tube feet.

AF2: Yeah, now is he eating the algae off the glass? Is that what he's doing?

Rosemary: No, no, these are indeed carnivores

AF2: Oh

Rosemary: They are top predators

AF2: Wow

Rosemary: They are, they eat by diverting to their mouth (points out mouth) and they get to eat, well they were fed a little earlier, they get to eat meat whether it's clams, or mussels or a piece of fish.

Here, the visitor exclaims her excitement about seeing a sunflower star, and Rosemary uses a quick snippet to build upon the reaction and point out something further to observe. The opportunity she provides is enough for the visitor to ask more questions and continue the conversation.

Alongside the action of providing snippets of information was questioning (both docents asking and answering) and identifying. Here, again, animals on display were central to conversations; approximately half the questions posed to docents by visitors were related to the animals. Similarly, 92% of questions posed by docents to visitors were also animal related. Questioning and answering between docents and visitors were present in nearly all SIs, as was the identification, or naming, of animals in the exhibits.

Identification was also often hand in hand with questioning, where 31% of docents' responses to visitor questions involved identification, and 27% of docent questions were followed up with identification once the visitor responded. Again, like snippets, questioning and identifying was responsive to visitor reactions, observations and comments.

Questions posed by docents were most often associated with establishing visitor prior knowledge or experience with an item or concept, or determining whether a visitor had noticed a particular animal, animal behavior or animal adaption in which to invoke a subsequent set of interactions with that item of interest. Below, Tina is identifying an abalone:

Transcript 5j, Tina talks to a visitor about abalone

Tina: And do you know what these little guys are called? [She points to an abalone in the anemone tank]

AM shakes his head

AF: No

Tina: These are abalone

AF: Oh ok

Tina: And I'm sure you've seen abalone shells...

AM: Mm hmm

Tina:...like that there [she points to biofact on the tank]. I don't know where this one thinks he's going [AF chuckles] but they do move around pretty well

Here, Tina uses a question to not only point out an animal (in the first line of the transcript), but also establish whether the visitor has any prior experience of it. She then makes a connection between the animal and a more familiar artifact, its shell.

Other questions posed by docents were centered on asking visitors what they thought an animal might be/do, asking visitors to compare or speculate what an animal would look or feel like, and those that invited visitors to participate in the mini-activities

or hooks described under the first claim above. In the samples below, Kim encourages the female visitor to make a guess at the sea cucumber's texture from its appearance via questioning, and Dennis uses a provocative question to invite the visitor to participate in the inevitable sea urchin hug:

Transcript 6d, Kim invites visitor to touch a sea cucumber

AM: Oh that, it's moving...

AF: [pointing to cucumber moving] He's going

Kim: Oh that's a sea cucumber; you can touch if you like

AM: You can touch it

Kim: You can, but before you touch it what do you think it feels like?

AF: Er, kind of rubbery?

Kim: Ok

AM: Could be sharp

Kim in this case wants the visitor to touch the sea cucumber, but asks the visitor a question to promote speculation of what the texture might be. This causes the visitor to pause and consider the appearance of the sea cucumber before she touches it. Kim therefore promotes additional observation and curiosity, and extends the touching activity by using a simple question.

Transcript 1j, Dennis encourages a visitor to get a sea urchin hug

Dennis: Now have you had your sea urchin hug today?

AF: I don't do sea urchin hugs...sea urchin hug

Dennis: Well...

AF: What?

Dennis: Take one finger and put it between their spines

AF: Oh, you're kidding

Dennis: No

AF: It'll hurt me

Dennis: No it won't

AF: You're sure?

Dennis: That's why you gotta go between the spines

AF: Yeah! That's the secret

Dennis: Yeah, that's the secret

AF touches the sea urchin

Dennis here is inviting the visitor to the hook activity using a question. Despite the visitor's concerns over touching a sea urchin, the question is enough to get the visitor interested in participating. In this way, the question is provocative, and intrigues the visitor. As a part of his repertoire (discussed below), Dennis was also often observed adding "you seem a little stressed" to add humor to his urchin hug invitation as he does in the transcript below:

Transcript 1a, Dennis facilitates an urchin hug

Dennis: Did you get your sea urchin hug? You look a little stressed.

[AF and AM laugh].

AF: Not yet, yeah

AM: Well..

Dennis looks at AF

Dennis: [pointing to an urchin between them with a wooden stick] Take one finger and put it between the spines [demonstrating] and just leave it there for a minute.

[AF puts her finger between the spines of the urchin, the urchin responds]

AF: Ahhh [he looks at AM]

Dennis: Don't you feel better?!

In thinking about snippets of information and questioning, Docents explain the use of snippets as a means for engagement and note that they enjoy using them.

"I do like to give [visitors] the odd facts, like something unusual that will really... did you know the monkeyface prickleback can live over 30 hours out of water? Whoa!" (Kim, preliminary interview)

Similarly, docents perceive the extent to which visitors ask questions as a measure of a successful bid to engage, and enjoy visitors who ask a lot of questions. From their perspective, the more questions a visitor asks, the more interested they must be, and this perspective motivates them to encourage questioning via the snippets of information.

"...most [visitors] who come in are interested in something and so most of them will ask intelligent questions. Some people just you know, they look and you

know, that's ok, but there are people who are quite educated, quite intelligent and you get into really interesting discussions with them about their experiences with some other marine facility or where they live near the coast or where they don't know anything at all, and they ask really, really good questions sometimes.”
(Barry, preliminary interview)

C. Docents facilitate conversations around science based on visitor patterns and using a shared repertoire of practice and information

Expectedly, as snippets of information were used by docents to answer questions, some snippets appeared to be part of a particular docent's repertoire, one that has developed in response to having answered particular questions or comments frequently posed by visitors. In this example, Rosemary uses the same snippet about the octopus' intelligence as Tina used earlier.

Transcript 2d, Rosemary talks about octopus intelligence

AM: [To CF] [Octopuses are] intelligent. Do you think they can read? Huh?

CF: No

AM: I don't know [laughs]

Rosemary: [Approaching from behind] Well you know, they think they're about as intelligent as a house cat.

AM: Hmm, well really

Rosemary: But, perhaps they're learning more things about the way they learn, the way they remember

Here, again, Rosemary is responding to a visitor's comment about the octopus, and adding a snippet of information as a talking point. The snippet is identical to the one Tina uses, and strengthens the notion that docents use a shared repertoire of practice within their communities of practice. Docents explain this in terms of understanding visitor patterns. Valerie reports that she is aware of the patterns in visitors' responses to the anemones and abalones, and as a result has developed specific snippets she likes to draw on in those cases:

“Ya, that’s a typical question, about them being sticky. ‘Oh, these are really sticky’ so I always try to mention about the stinging tentacles cause that’s pretty fascinating cause it’s the green ones mainly, the other ones aren’t, the other ones are a little bit sticky but the green ones are really, really sticky. A lot of questions about the abalone. The main one is about are they edible so there’s always little conversations about eating abalone and where ever you can find them, if a lot of people around here eat them or not.” (Valerie, post-observation interview)

In this sense, snippets of information are not only used in response to visitors’ questions, comments and observations of objects, but are themselves responsive to those patterns.

The idea of a docent having a repertoire of snippets suggests that docents both a) notice patterns in visitor interactions and b) have an available resource of snippets they feel are valuable to visitors and adaptive to their levels of interest. Using snippets to “bait” visitors and determine interest level in this way was a popular topic of conversation in focus group 1:

Transcript Focus Group 1, discussion around baiting visitors

FCD1: I mean, child, different ages different ways. Some want to talk to you, some don’t.

FCD2: You get a sense of the level of interest.

FCD1: You put things out and you bait, you put bait out and see if they take it and where.

FCD3: What is there interest? What do they really want to talk about? What do they want to ask?

FCD2: You can’t just talk the same way to everybody. You have to find out where they are.

Here, the docents are explaining the use of snippets as hooks, but stressing that they pick and choose those hooks based on the patterns they notice in visitors, and by trial and error with the information. Others in this group felt that acquiring new snippets was also an opportunity to find new “bait” and refresh their own repertoire, highlighted by the example below.

“I was going to say that sometimes you are reacting always in collaboration, you’re having a dialogue. But I’ve been doing this for 8 months, so there’s still tons of stuff that I don’t know, like if someone asks me a question and I research it and find out, I tend to actually want to use the answer to that question several times during the next day, or the next time I’m volunteering. Number one, because I find it so cool and number 2 because it sticks with me and become part of the whole repertoire of possible answers.” (Docent, Focus Group 1)

As this example suggests, the snippets become central elements of docents own lifelong learning not only in support of their own desire for information but also to support the practices they develop for addressing patterns in visitor questions and actions that they notice from their daily interactions. This example also illustrates the sources of information docents turn to in their ongoing lifelong learning of content and of practice. This docent reports learning on the job and from collaboration within the community of practice, but they also report learning content in more traditional ways by seeking out information through self-guided “research.” Like a visitor, the docents’ own curiosity has been piqued by a new experience, and she engages in free-choice learning practices to learn more in order to use that knowledge pragmatically in her ongoing practice as a docent. From this perspective, the development of a shared repertoire of snippets of information between docents is part of a cycle of understanding visitor patterns of interest, and sparking their own interests.

Summary of Theory Generated in Claim 2

Docents as teachers are perceptive about their audience. They pay attention to patterns and provide information in response to those patterns. Docents utilize a shared

repertoire of practice and information in their community developed from understanding visitor patterns of interest.

Claim 3: Docent Roles Can Be Conflicting and Require Balance

A. Docents believe they must strike a balance between facilitating visitor learning and protecting exhibits

The actions recorded highlight the activity of docents “policing” exhibits (particularly the touch tanks) and reminding visitors about animal safety (i.e. touching them properly, being gentle). Such actions suggest docents place value on protecting or “guarding” the live touch tank exhibits in the VC as well as their interpretive role. The samples below demonstrate Tina providing instructions on how to touch as preventative measures to animal safety, and Dennis having to correct behavior while attempting to engage a visitor in the leather sea star activity described in claim 1.

Transcript 5i, Tina is staffing the anemone tank

AF: [To AM] Look at this sea-snaky thing hun!

AM: I know. [To Tina] I can touch?

Tina: You can touch. The only thing we ask you is you not touch the opening of the sea anemone, just their tentacles and their sides. But otherwise you're welcomed to touch

Transcript 1e, Dennis reminds visitor to be gentle with sea star

Dennis: Ok, I want you to take two hands...two finger, two fingers (he wiggles two fingers), rub pretty fast and pretty strong...pretty hard...(He demonstrates)

AF goes to touch the leather star

Dennis: two fingers, two fingers! [Correcting AF's touching] Ok, they're you go.

AF: Sorry [gives seemingly nervous laugh]

Although this was not a particularly frequent reoccurring theme in the observations, docents were very explicit about this role in the interviews and focus

groups. Below, Dennis and Valerie were both concerned about visitors becoming over-exuberant with the touch tank animals.

“I’m very conscious at [the anemone] touch tank because the kids, what they want to do, they harass the sea anemones so the point to try and make them close up so I’m very conscious of that and try to keep them from doing that. I’ve had adults come in and they put their finger down the hole inside the anemone, it’s kind of important patrolling and make sure everybody’s not harassing the animals.”
(Dennis, post-observation interview)

“...I think the important thing that we do is just kind of let people know, you know, hey these are living creatures you know and you have to be careful you know cause some people you know, they kind of get a little carried away and you know, get a little pokey pokey and it’s like ‘oh yeah be careful you know, you’re gonna hurt them’ and you know, they’re a living animal you know kind of like us, you know, you don’t want to be poked and prodded either [laughs].” (Valerie, preliminary interview)

However, in some cases the docents felt that protecting the animals on display was less of a priority than that of communicating the science behind them. This did, in fact, become an area of debate in one of the focus groups.

“I mean some people think my job is protecting animals and some people think the most important job is educating the people. I lean towards the latter but I still know it’s important to protect the animals and so it’s not an issue with me. It’s just that I prefer that people want to know something they can ask questions, but I don’t like being policeman but sometimes you have to be.” (Barry, post-observation interview)

Transcript Focus Group 1, group discusses protecting exhibits

FCD1: I think there can be over emphasis by the institution on protecting the animals. That is, if I had a choice between imparting enthusiasm and interest in the octopus, and making sure nobody pokes an anemone, I’ll let the anemone get poked while I’m talking about the octopus.

FCD2: But you have to watch the animals too because that’s part of your job. It’s not just education, it’s part of what you are doing.

FCD3: I would say ideally sometimes when you’re working with someone who’s poking the anemone you can encourage them into what’s a better way to do it and help them learn something about the animal at the same time, gently. Like steering, instead of ‘no, no’.”

Such a debate is interesting because it highlights the division between whether protecting animals is a major component of their role, or simply a reality of working with the public. The latter places more emphasis on the quality of a visitor's learning experience in the context of science, while the former emphasizes the protection and care of the environment. Overall, however, the docents agreed that it seems important to attempt to strike a balance between the two, even if visitors' harming animals is frustrating to a docent.

B. Docents are also concerned about balancing people skills with being a scientific resource.

Docents also discussed the value of people skills in being a docent, as well as being a resource of scientific knowledge for visitors. Greeting was a component of many interactions as they were initiated, such as in this example where Kim greets a visitor as they approached the sea star tank.

Transcript 6a, Kim is staffing the sea star tank

AM approaches and looks in tank

Kim: Hi

AM: Hi there

Kim: How are you today?

AM: Good

Kim: Good. Aren't these amazing creatures?

Greeting in this respect was an example of helping visitors feel comfortable and welcome in the visitor center, a notion which docents believed was an inherent part of their job:

[My role] number one, you're greeting, interacting with the visitors, you're, I always feel one of the main things is basically you're here to give the visitors a

enrichment and telling them about the animals but you're also here to help protect the animals from the visitors. So it's kind of a you know, but it's usually just interacting you know, greeting and interacting with visitors; making them comfortable and giving them some knowledge so when they leave here they have a little better knowledge of what they're looking at when they get out to the tide pools." (Brenda, preliminary interview)

There was a prevailing theme that participants believed being a good "people person" is essential to the role of a docent, and whether they feel confident in their knowledge of marine science or not, a docent must be able to have a conversation as well as spark interest around marine science. They seem to value a balance between knowledge and interaction, and even though they may not feel confident about what they know about marine science, they are confident they can help visitors develop an appreciation for marine science, based on a visitor's learning needs. As examples, Dennis felt his weaknesses as a docent lay in his content knowledge, and Rosemary felt at times she learns more from the visitors than they learn from her.

"I'm not as smart as I'd like to be. I get a lot of questions that I do not know the answers and sometimes I feel that I should know the answers and I don't." (Dennis, preliminary interview)

"I don't know, a lot of times [the visitors] teach me, some of them are more knowledgeable than I am [laughs]. I learn things from them, sometimes I think I learn more from them but hopefully I teach them a little something too." (Rosemary, preliminary interview)

However, many of the docents felt their strengths lay in understanding the visitors, and found the people element of the job the most enjoyable part.

"I think as a volunteer, if you're not friendly and don't get the personal conversation, if you sit back and just tell them the straights, the specifics; this is that, this is that, I think you're missing out a lot. Like I said, always feel like you're here for more than, you're interpreting as much information as you can but

you're also making them feel more comfortable and enjoying their visit. That's the way I feel, some people don't." (Brenda, post-observation interview)

"...my strengths are I enjoy being with people, I love kids as regular people and I really like to ask people: have they ever thought about or have they ever looked at or to give them a piece of odd or unusual information they don't really know and watch them turn and share it with people down the line. I like to empower somebody with an interesting piece of information and watch it travel." (Kim, preliminary interview)

In this regard, docents feel they encounter a variety of learners and learning styles with the people they interact with and, in response, stress the importance of being flexible in their approaches while engaging visitors in the VC.

"I mean, I can sometimes get the feel for when a person wants to know things and when they just want to look and you know, if I started talking to them and they started asking me questions, I can go on and on but if I, you know they ask me a question and they say 'oh' and their attention is probably elsewhere and I let them concentrate on what they wish to." (Tina, post-observation interview)

"Some things I try to automatically tell people but to a good extent it varies with the visitor's interest, the questions, how they seem to react to my information. I try to be flexible." (Ruby, preliminary interview)

Simultaneously, docents viewed themselves as a resource of information for the public, and believed that answering visitor questions is a significant part of their job as a docent.

"Besides feeding the fish, [my role is] to help educate the public. A combination of answering questions and giving information." (Ruby, preliminary interview)

As a result, docents feel more valued when they are therefore used more as a resource.

"Well, you know, my theory about volunteering is that I want to do what would be helpful for the situation I'm in and imparting knowledge here is, uh, my goal. And, you know, when people aren't interested, you know, I'm kind of disappointed... I try to get people involved. And when they do respond, I'm very

happy about that. I'm very happy to answer questions. If they don't respond, it's too bad. But I do try." (Tina, post-observation interview)

However, docents acknowledge that the public they encounter may not actually view them as such a resource, and even though this might be disappointing in terms of fulfilling their role, docents understand that this is just a reality of interacting with public audiences, and different types of learners.

"If something's not working, you're monitoring it if it's not working you then you can switch, you adjust and switch to something else and to try to find the hook to get them, even if they walk away with just a couple of pieces of something they didn't really realize before, that's a good thing I think. It might peak that curiosity for the future." (Kim, preliminary interview)

In this regard, docents reported that they utilize other staff and docents as resources to help increase their own learning. They also utilize resources made available to them by the VC (such as books and information sheets at the touch tanks), and uncover gaps in their knowledge through their interactions with the public and answering questions. They attempt to fill those gaps by gathering further resources and asking other docents and staff for further information. Filling those gaps helps them to be better scientific resources. The docents below discuss where they learn to fill knowledge gaps.

"Myself, I love to read so I'm always you know, looking at books and going online and stuff and you know, if they have like little workshops and stuff, those I find really helpful and those you know, help everybody you know that wants to sign up for them. I mean we've had a few different little things, like awhile back they had a workshop about the wave energy and stuff and so I went to that cause we're going to be having that exhibit and stuff, so." (Valerie, preliminary interview)

"[I learn from] talking with [the museum educator], she tends to be who I work with... talking with the aquarium specialists, the classes, the seminars, and learning on the job when people ask a question and I didn't know about that thing or you know you, find out about it from [the education specialist] or somebody

else, then I have more information to give them for next time.” (Kim, preliminary interview)

This appears to be a continuous process, and is part of the process of both learning to become a docent, as well as maintaining good practice once established.

“There’s always something I can learn... [I learn] on the floor looking at things and sometimes there’s something... some of it’s interesting and I’ll go look that up... do a little research or something.” (Brian, preliminary interview)

The quotations above highlight the balance that docents attempt to strike between what they know about science and what they know about interacting with people. However, being able to have meaningful interactions and respond accordingly to visitors (i.e., answer questions) seems more important than how much exactly they know about marine science because answers to content questions can be sought, but interacting with people requires skill development. Here, docents report most of their relevant science has been learned whilst as a docent; however, the skills required to work with people have been developed from prior professional experiences, as well as learning on the job.

“I think [learning about interacting with visitors], other than being in the school system and volunteering, and it’s just from the experiences here and you know, following people around. When I first started, followed people around for a while so in the beginning you get all kinds of questions and you always had to look things up in the book and then, it’s just learning experiences for yourself.” (Jane, preliminary interview)

C. Docents use their prior knowledge and experiences to fulfill their roles

Docents also reported their prior experiences, both personal and professional, played a part in not only why they originally became a docent, but also in helping them to fulfill their role as an interpreter. All participants noted they enjoyed working with

people, and primarily became a docent because of that reason. They were also explicit about using their professional experiences (both paid and voluntary) to help them interact with the public. Here, many of them reported transferring “people” skills from past careers, and in fact the majority of participants reported their people skills were one of their strengths as a docent.

“I’ve had an awful lot of training, supervisor training, training on dealing with employees, how to engage employees, just a lot of training along those lines... So I think one of my strengths is, is to be able to interact with the people and get them interested in what’s going on here.” (Dennis, preliminary interview)

“Well, when I worked, I had people working for me. I was a manager, sub-manager, so I had people working for me underneath, so I had to deal with them, had people above you know I had to deal with them. So working with people, I had to talk to people. And then my other things like in [my other volunteer position at the] hospital I meet patients, and I talk to patients and I’ve been doing that for seven years and so you know, you interact with people you kind of get a sense of where they are and what their level of real interest is and things like that you know so.” (Barry, preliminary interview)

Learning how others talk to and interact with visitors is primarily how participants learned to fulfill their role as a docent, and participants felt that learning to successfully interact with the public makes for being a successful docent. Docents in general feel confident in interacting with the public, and value their people skills.

“[I have learned to interact with people] I think just being here and just kind of watching how the other volunteers interact with people, you know the ones who have been here longer than I have, you know kind of talking to them. You know, I mean ‘cos sometimes you know they’ll share experiences you know about you know, this person or that person that came in you know and they had a, kind of memorable experience or something with a visitor.” (Valerie, preliminary interview)

Overall, docents were from a wide variety of professional backgrounds, including education, healthcare, engineering and scientific, and held various levels of perceived

prior knowledge of science. However, regardless of their background, docents were connected by their interest in marine science, relative to either their own personal hobbies or interests (e. g walking their dog on the beach) or simply from residing at the coast.

“[I initially decided to volunteer here] because I’ve had an interest in marine for a long time. I’ve taken classes here form the 80s, I’ve lived here for almost 40 years...” (Rosemary, preliminary interview)

Often the desire to become a docent initially lay in the ability to link their marine science interests with their interests in working with people. These two factors seem to play an intimate role in driving volunteer motivations to interpret science to the public.

Lastly, the interviews also revealed that docents were likely to be highly-educated, older adults (often retired) who may or may not volunteer in other settings. If they did volunteer elsewhere, that position could show some similarities to their position at the VC, but that the VC position was generally a unique experience to them.

“I like teaching; I like people, interacting with people. I’ve always, even when I was a medical assistant, that was the main thing I did was translate what the doctor said into regular talk with people so they could understand it. That’s what I like to do, I like to try to take technical information that I may understand and translate it into something that people without a background can understand and maybe want to learn more, that’s my favorite thing, is to help that interface.” (Kim, preliminary interview)

Summary of Theory Generated in Claim 3

Docents care about their setting and the exhibits within it. They also care about the visitor experience as a whole, and have to be flexible when working with different types of learners. They believe that being a docent means balancing potentially conflicting roles.

Claim 4: Docents Utilize Tools of Interpretation to Help Build Personally Meaningful Experiences for Visitors

A. Docents use analogies and gestures to explain phenomena

As part of mediating the activity of learning in the museum setting, docents use teaching tools to explain items and phenomena observed in the VC. A variety of tools, both physical and discursive, were employed by docents to provide examples and help visitors visualize the information being presented or engage in it in more personally meaningful ways. Such action was mostly used in conjunction to providing snippets of information about animal adaptations, anatomy and behavior. As an example, analogies were used to describe processes and connect visitors to everyday objects and human behaviors.

Transcript 1e, Dennis describes the texture of the sea cucumber

AM2: (touching the cucumber). Oh it seems to be like a rubbery kinda texture

CF laughs

AM1: Oh wow

Dennis: Like gummy bear?

AM2: Yeah

AF1: Ohhh. That is awesome

Transcript 7a, Brenda talks to visitors about the octopus

Brenda: Yeah, the hard part [of the octopus] is only one part of its body [Brenda leads them over to the back of the octopus tank and shows them the "hard part" - the beak biofact]

Brenda: This is the only hard part of the octopus

AM: That's it right?

AF: Oh

Brenda: They can basically get in and out of anything...

AF: That's smaller than that

AM: That's smaller than that

Brenda: That's like the size of a golf ball, oh not a golf ball, but a erm, tennis ball

AM: Yeah, oh.

AF: Yeah

AM: That's a cool ability

Brenda laughs

In both examples above, Dennis and Brenda describe something about an animal and

connect to an everyday object: The texture of the sea cucumber to a gummy bear, and the size on an octopus beak to the size of a tennis ball. Here, they are using language to create a picture that the visitor can both relate to and visualize. The docents are making an unfamiliar concept familiar.

Similarly, the gesturing of hands and showing of biofacts (biological artifacts, such as preserved items, shells and bones) were used to provide visual aids for describing an object, a process or an animal behavior. Figure 8 illustrates examples using hand gestures and biofacts as aids for explanations at the touch tanks. Here, Kim in the first photograph is explaining how a sea star eats a mussel by latching on to it and pulling it apart with its tube feet at the sea star touch tank. Her hand gestures motion the pulling apart of the mussel as the sea star has a hold of it. In the second photograph, Brian is describing the shape of the gel food made by the VC to feed the sea stars in response to a visitor question. Gestures also included those that modeled behaviors that the docents were encouraging, for example the sea urchin hug in figure 6 was often demonstrated via gestures.

The third photograph in figure 8 shows Dennis showing the visitor the preserved internal organs of a sea cucumber whilst explaining how sea cucumbers expel their internal organs as a defense mechanism. An urchin biofact was used in a similar way. This biofact was an urchin shell encased in acrylic to preserve it. In the fourth photograph in figure 8, Jane uses the urchin biofact to show visitors what an urchin looks like underneath while describing its feeding process.



Figure 8: Docents Using Gestures and Biofacts. (1) Depicts a docent explaining how a sea star pulls open a mussel to feed on it using hand gestures. (2) Depicts a docent describing the shape of fish gel food using a gesture (3) Depicts a docent showing a visitor the innards of a sea cucumber while explaining their defense mechanism, and (4) depicts a docent showing a visitor the urchin biofact while explaining how an urchin feeds.

Gestures and biofacts were nearly always utilized where no other physical representation was available, and the use of biofacts was often associated with a particular snippet of information, for example the sea cucumber innards with the defense mechanism information described above. One might expect that signage around exhibits would also be used in a similar way to biofacts; however few references to signage were made at all throughout the interactions, most likely as the majority of interactions took place where exhibit signage was limited.

B. Docents also use humor and storytelling to make connections and provide context to scientific content

Humor and storytelling were also used in conversation by docents. Here, docents shared personal experiences related to the conversation at hand, and intermittently interjected humor. An example involves Dennis talking about the anemones.

Transcript 1m, Dennis is answering a visitor question about the anemones

Dennis: How come they're closed up? In the wild when they get there, the hole in the center is their mouth, so when they get a fish, there's something they want to eat, they'll fold it in and pull it in into their mouth and they'll also close up when they've had way too much fun. We have a lot of people come through here, some of them begin to close up

AM laughs

Dennis: That's our standing joke, when we close at 4 o'clock, they'll go "oh, thank goodness" (mimics opening with hand gesture) and open back up

AM: Thank goodness, no one's touching me anymore. [He laughs]

Dennis: I have people come in and say (mimicking) "you know, if you go around and around like that [demonstrates using finger without touching] they'll close up.

AM laughs

Dennis: [Sarcastically] Hmm, why do you think they do that? 'Cos they don't like it!

AM: They don't like it (laughs)

In this example, Dennis is describing the process of anemones closing up, especially when the touch tanks get busy, and jokes that the anemones open back up when closing time comes around. He also sarcastically mimics his past experience with visitors who were rough with the anemones and cause them to close up. In using humor, and sharing his experience with past visitors, he is explaining that the anemones close up to protect themselves. The visitor is laughing in response to Dennis' humor. Such an example shows that docents can deliver snippets of information via humor and/or sharing stories. In another example, Brian talks to visitors about the water in the tanks.

Transcription 8e, Brian is talking about the water in the sea star tank

[AF1 puts her finger between the urchin spines, it hugs]

AF1: Oh it's cold, it's hard to believe that anything's gonna live in there

AM: Cold water isn't it? [Laughs]

Brian: It's from the bay; it comes from the water out there in the bay. You wanna go...

AF1: That's why I don't go swimming

Brian: You wanna go swimming out there? [Laughs]

AF1: No, that's why I don't, thank you!

AM: I can see why those kids were wearing wetsuits [referring to early story shared with group]

AF2: Yeah, no kidding

Brian in this case is explaining why the water in the tank is so cold to the touch: It is pumped in from the nearby estuary. He sarcastically jokes about the visitors going swimming to emphasize the temperature, which prompts the other visitor to share a story about seeing children in the bay earlier in the day. The humor in this case supports the reason why the water is cold.

Personal stories and experiences were most often used by docents to provide context to snippets of information they provided, or illustrate a point being made about that information. Storytelling often preceded the identification of an animal or explanation of a process perhaps to exemplify that information in a more personal way.

Below Kim is sharing stories about a past octopus at the VC.

Transcription 6b, Kim talking to visitor about the octopus

Kim (at the octopus tank): How old do you think they live to?

AF: How old? How old is that guy?

Kim: They only live to be 3-5 years

AF: Oh really, 3 to 5?

Kim: Yeah

AF: Oh, so he's 2 maybe?

Kim: Don't know

AF: Don't know

Kim: Don't know exactly how old. We did have a female in here gosh a year or so no, starting laying, putting eggs, stringing eggs up here (points at side of tank)

AF: Oh yeah

Kim: Of course, they weren't fertilized, so they die after they have their eggs taken care of, like him, so they really quickly decided that was the end her service, we release them back into the ocean (points out the door) out there, let them go out

AF: Oh that's nice

Here Kim is sharing a prior experience so as to talk about the lifecycle of an octopus as she and a visitor observe the octopus in its tank. The story is brought about by answering the visitor questions about the octopus' name.

In relation to the value they place on people skills described in the claim three, docents explain their effort to connect with visitors on a personal level in terms of helping visitors feel comfortable and welcome so they are more likely to ask questions and can relate to the information in the VC. They are also explicit about their personal enjoyment of making personal connections with visitors by sharing their prior experiences.

“I think as a volunteer, if you're not friendly and don't get the personal element, if you sit back and just tell them the straights, the specifics; this is that, this is that, I think you're missing out a lot. Like I said, I always feel like you're here for more than, you're interpreting as much information as you can but you're also making them feel more comfortable and enjoying their visit.” (Brenda, post-observation interview)

Summary of Theory Generated from Claim 4

Docents use interpretation as a pedagogy to engage visitors with science and create personally meaningful experiences.

Sources of Learning for the Practices Observed and Explained

In explaining the practices observed from the docent perspective, a number of sources of learning of these practices were highlighted. As exemplified by the description of the claims, these sources were not specific to each set of actions and/or practices. As a result, it is important to clarify these sources for the purpose of answering research question three. To therefore summarize, the sources of learning reported by the docents were:

- Each other (i.e. within their communities of practice)
- Other VC staff, such as educators and volunteer managers
- Their professional backgrounds, and/or prior knowledge/experience
- External resources such as the internet, exhibit guide sheets or seminars
- Conversations with visitors

These sources were those that were most frequently reported by the docents during the preliminary interviews and focus groups and correlated with the action observed overall.

These sources of learning can be described in terms of the docent community of practice. The docents learned from one another as a form of legitimate peripheral participation, or what Lave and Wenger would describe as apprenticeship (Lave & Wenger, 1991). Docents believed they primarily learned their practice on the job, and reported learning peripherally from other docents, staff and visitors, as well as from noticing patterns in visitor behavior. As examples, Tina described how an animal observation, initially brought to her attention by a visitor, is now part of her repertoire of

practice. Dennis explained that he sometimes experiments with the practices he observes other docents utilizing on the VC floor.

“It wasn’t until somebody pointed out to me, one of our visitors, that the coral are harder than the strawberry cup anemones, and so of course I had to feel it and I thought how neat is that. Not that long ago and once I became aware of it I started pointing it out.” (Tina, post-observation interview)

“Some of [the other docents] I look at and I go “well that doesn’t work,” you know, or um, there are a couple that, yeah, you definitely can learn from how they do it and I don’t... I don’t dwell on well how do you do this, it’s just something that you pick up and you think well oh, that works pretty good for them, that’s interesting, let me try that.” (Dennis, preliminary interview).

In essence, docents were learning through engaging in practice itself as they worked towards shared enterprise.

To supplement their learning in an apprenticeship model, docents also utilized external expertise to attempt to master both knowledge and teaching practice. Such expertise derived from their own professional expertise (such as having supervised people, or taught in classrooms), interacting with who they deemed as experts (such as husbandry staff or on site scientists) and consulting external sources of information (such as the internet or reference materials). Docents brought in these external forms of expertise as a means for professional growth, i.e. to answer visitor questions they could not already answer, or to improve their understanding of an area of personal interest or exhibit observation. As examples, Brian explained that he will research something in an

exhibit that catches his eye. Jane described who she seeks help from in the VC if she cannot answer a visitor question.

“[I learn] on the floor looking at things and sometimes there’s something. Some of it’s interesting and I’ll go look that up, do a little research or something”
(Brian, preliminary interview)

“If I can’t answer [a question] I will look in the notebook in the back or I will find someone, usually someone’s around, [the volunteer coordinator] or [museum educator] or [the aquarist] is really good about stopping and answering, or someone else who has been here even longer.” (Jane, preliminary interview).

Overall, docent learning was situated in the museum setting, and reflected not only the needs of the visitors they interacted with, but also the needs of themselves as learners and members of a community of practice. Docent learning was therefore motivated by both professional and personal goals in order to be a quality resource of information for the public as well as satisfy their own appetite for learning science.

CHAPTER V

CONCLUSION

In light of the results of the study, this concluding chapter provides a discussion of the major findings in association with the original research questions and relevant theory. It also provides a reflection on the strengths and weaknesses of the study, as well as the implications and significance to the field at large and suggestions for further work.

Summary of Outcomes

Overview

The purpose of this study was to provide information about and generate theory on how docents choose to communicate science in interaction with visitors, the interpretive strategies they adopt and how these relate to their experiences, training and ongoing education. The research questions asked:

1. What are the strategies and tools docents employ whilst interacting with visitors in a museum setting?
2. Why do docents choose to employ such practices and how do they explain them?
3. What sources for these practices do docents themselves suggest?

The goal of this study was to explore the practice of docents as they interact with visitors in a museum setting both in terms of the tools docents employ to communicate science to visitors, as well as their explanations for choices of practice and sources of learning of said practice. Through detailed inductive analysis of the mediated action taking place

between docents and visitors in a museum setting, the outcomes of the study show that docent practice in the context of communicating science attempts to both encourage new experiences for visitors and deliver information in a personally meaningful way, which requires balancing the implementation of people skills and scientific knowledge alongside protecting and interpreting exhibits. Such practice is mediated through discursive tools such as asking and answering questions, providing factoids, identifying objects, using analogies or humor, and sharing stories or experiences. It is also mediated through physical tools such as encouraging visitors to observe and touch, providing “hooks” or mini-activities, pointing to objects of interest, and showing biofacts. Practice observed were implemented by docents as a means to further science learning and environmental compassion for visitors, and learned from prior experience, via on-the-job experiences, in conjunction with other staff and docents, and by seeking additional resources.

The outcomes of this study can therefore be summarized by four claims in response to these research questions:

1. Docents see themselves as promoting visitor learning
2. Docents encourage conversation around science as they mediate interactions with museum objects
3. Docent roles can be conflicting and require balance
4. Docents utilize tools of interpretation to help build personally meaningful experiences for visitors

Figure 9 provides a graphical representation of these claims, depicting that these practices described are not independent of one another, but are simultaneously occurring forms of interpretation taking place as docents mediate learning between visitors and objects.

Collective Meaning Making Processes

As a theoretical framework, mediated action was applied to the study to explain docent practice in terms of the object-orientated action docents mediate as visitors interact with objects in the museum setting. CHAT was applied to provide the socio-historical components of the activity system (Engeström, 1999) as a means to examine the collective meaning making process of that action (Yamagata-Lynch, 2007, 2010). The claims, and subsequent generated theory, therefore explain docent practice in terms of the subjects, objects and cultural tools (the mediating artifacts) being mediated during docent visitor interactions, and consider those in the scope of the rules, community and division of labor that influence how and why the docents choose to operationalize their practice as a member of a community of practice, as depicted in figure 10. Here, mediated action is considered at the broader societal level.

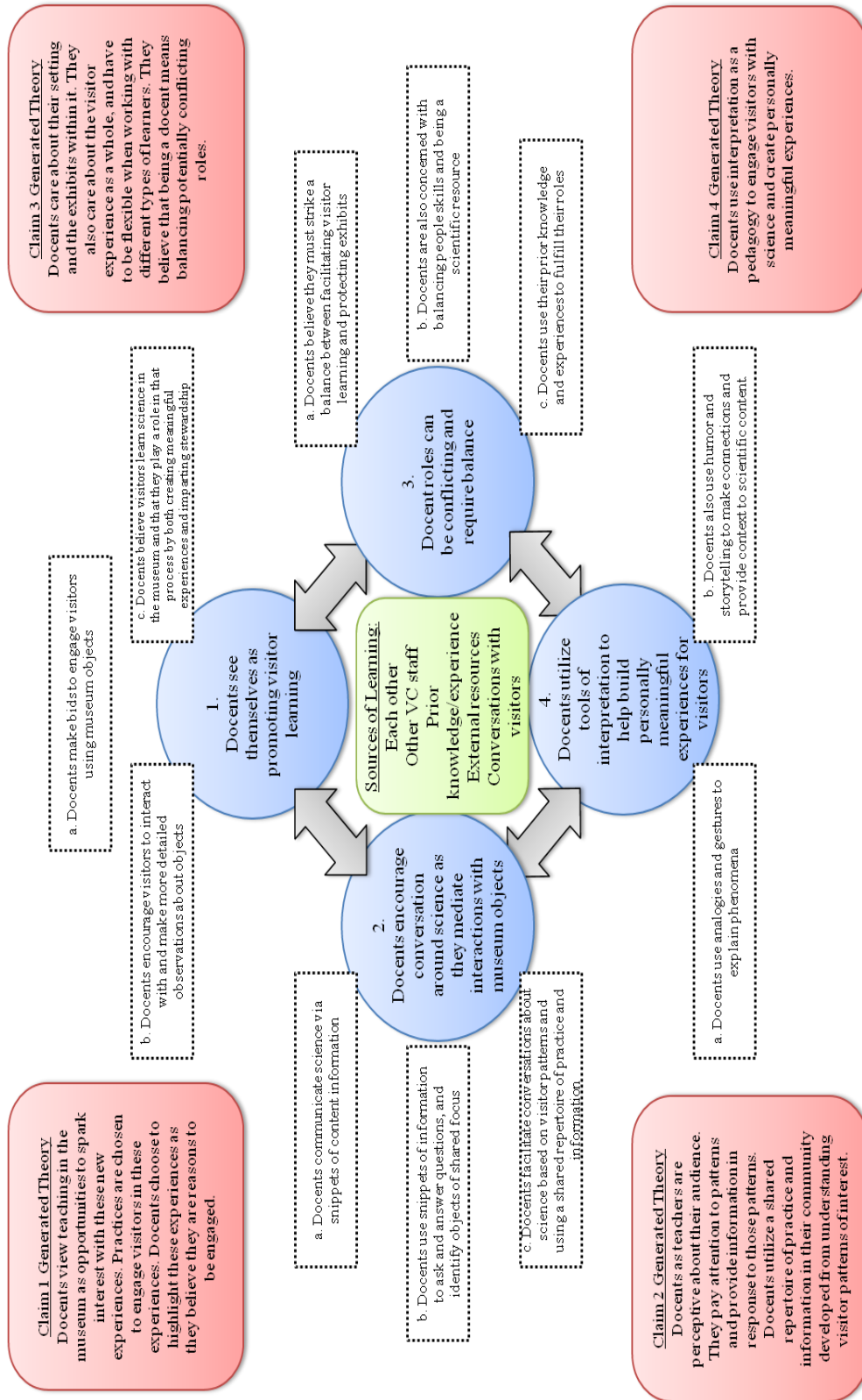


Fig 9: Representation of Claims as a Claim Map. The green box describes the sources of learning of the docent practice observed and is centrally located. The blue circles describe the overarching claims about docent practice. The dashed boxes describe each claim's underlying sub themes. The large red boxes describe the theory generated from each claim.

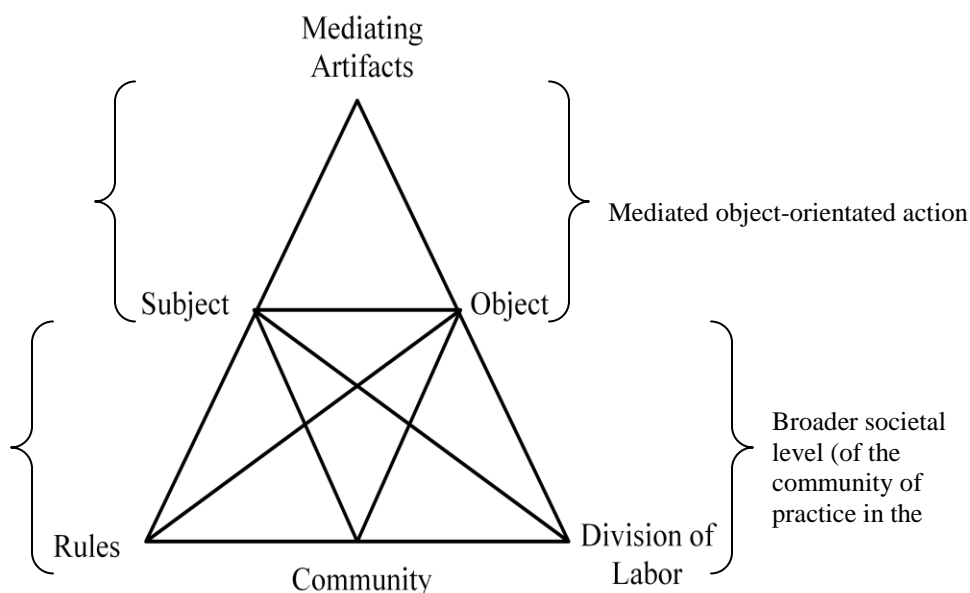


Figure 10: The CHAT Triangle. The object-orientated action of the docents as they interact with visitors is considered in the scope of the rules, community and division of labor of their communities of practice. Adapted from Cole and Engeström (1993)

From looking at object-orientated action in the context of the docent community of practice, subjects were docents and visitors, and sometimes other members of their community. Objects were museum artifacts, and mostly live organisms, the scientific understanding of which was often in essence the goal of the activity. Cultural tools included the discursive and interpretive strategies docents implemented to mediate that action, and sometimes other artifacts (e.g. biofacts). At the broader societal level, rules constrained the activity as docents' goals and perspectives about their practice guided their choices and interactions with both visitors for teaching and other community members for learning. The community, where action was learned and enacted, was the community of practice docents identified with in the museum setting, to which tasks were

rarely distributed between as docents replicated practice per visitor rather than shared it (Yamagata-Lynch, 2010). In this way, docents learned how to facilitate the tasks involved in communicating science to the public by legitimately and peripherally learning from other members of the community (Lave & Wenger, 1991) as those tasks were replicated per interaction with visitors. Tensions emerged where roles were strained by conflicting rules of docents practice as those tasks were enacted, exemplified by the tension created by attempting to simultaneously protect the exhibits while facilitating learning experiences, where docents struggled to balance the two rules.

Considering docent practice in this way suggests that as docents move towards full participation in their community of practice, they not only replicate the practice of other community members over numerous interactions with visitors, but also evaluate that practice in response to the tensions they observe as rules of the community are enforced, their observed patterns in visitor behavior and their own personal needs as learners. In essence, their practice is not just replicated; it is adapted based on the docents' perception of the learning community and its setting. Docents are therefore implicitly reflecting on practice as they practice. Such a notion is interesting because it suggests that the procedure of reflecting on practice is valuable to a docent community of practice as it is more authentic to the actual processes of developing practice already taking place, which may have larger implications for the professional development activities offered to docents.

The Bigger Picture of Generated Grounded Theory

In the larger context of the science education field, each claim generated a larger set of theories about docent practice as a whole. These theories are:

1. Docents view teaching in the museum as opportunities to spark interest with these new experiences. Practices are chosen to engage visitors in these experiences. Docents choose to highlight these experiences as they believe they are reasons to be engaged.
2. Docents as teachers are perceptive about their audience. They pay attention to patterns and provide information in response to those patterns. Docents utilize a shared repertoire of practice and information in their community developed from understanding visitor patterns of interest.
3. Docents care about their setting and the exhibits within it. They also care about the visitor experience as a whole, and have to be flexible when working with different types of learners. They believe that being a docent means balancing potentially conflicting roles.
4. Docents use interpretation as a pedagogy to engage visitors with science and create personally meaningful experiences.

Together, these implicit theories that are made explicit in the results and discussion describe docent practice as experiential, responsive to visitors, learning and stewardship orientated, and interpretive.

Alignment with Current Theory

The outcomes of this study strongly align with frameworks for good environmental interpretive practice as discussed by authors such as Tilden (1957), Ham (1992, 1999) and Regnier, et. al., (1992) as well as effective museum interpretation practices discussed by Grinder and McCoy (1985) and Hooper-Greenhill (1999b). Further they align with findings about best practices in work of other informal educators, as well as docents outside the science museum context. The outcomes also align with theory around family learning in museums (Ash, 2003, 2012; Kisiel et al., 2012; Rowe, 2005) in terms of docents promoting science talk taking place at exhibits and interactions with live animals. Based on their perception of role as a docent and intended goals for practice, docents are able to draw upon and apply cultural tools adaptively within multiple situation definitions (Rowe, 2005). However, as a perceived component of their role is to protect exhibits from misuse by visitors, role strain is present as docents attempt to balance a protective role whilst continuing to offer the same quality of learning experience they hope to induce. Docents sometimes overcome this struggle by attempting to facilitate an experience out of having to “police” an exhibit, which can provide some insight into how docents negotiate interpretive activity with visitors, and which ties in to ideas around power and authority in staff interactions with families (Pattison & Dierking, 2012). Here, the docents may be adjusting how they negotiate interpretive activity when switching between the role of protector and the role of interpreter, subsequently influencing the authority they perceive they have over particular

interactions. Tension exists where docents are unsure of which role they are adopting during interactions where policing is a concern.

Within their rather overlapping communities of practice, docents are simultaneously learners and educators, and implement interpretive practice by applying scientific knowledge gained from researching additional resources, and seeking answers to questions that they are unfamiliar with posed by visitors. They utilize the experience of the museum staff and other docents around them, and incorporate that into their practice as a continuous learning process. They also apply their past experience, enjoyment of working with people, and on-the-job experience of understanding visitor patterns in science interest and needs to building connections with visitors and making them feel welcome in the museum setting, which they believe aids learning experiences. Again, these outcomes align docent practice with what we know about the learning and practice of informal educators, as well as prior work around docent practice (Castle, 2001), how docents develop expertise (Grenier, 2005b, 2009) and expert docent characteristics (Grenier, 2011). In essence, the study is able to provide grounded results in a science museum context that align with the field's prior understanding of docents.

Adding to Theory

What this study adds to theory is that, because of the nature of how docents learn from their community of practice, what they learn whilst mediating learning experiences for visitors and what they bring to the table from their lives, docent practice is emergent from the community and setting itself and does not emerge from single learning

enterprises. Practice emerges from doing the job, and docents can explain their practice based on their experiences with visitors. Docents are key informants of their own practice and, similarly to that suggested by Castle (2006), are informal educators who can provide greater understanding about current practice taking place in the museum by reflecting on their own practice. They have goals for their interactions with visitors, and for their own learning, which may be implicit and are better understood by observing their interactions and gaining their perspective via stimulated recall.

The outcomes of this study support the assumptions outlined in chapter 1 that I began with: Docents in the VC do indeed interact with visitors as a means to communicate science; they make explicit and implicit choices about the practice they use to communicate that science; and docent practice is a form of environmental interpretation. What this means is that what we know about docents in the larger context of museums is also relevant to science museum settings, and that good environmental interpretation exists not only in national park and recreation settings, but also in science museum settings.

What is particularly interesting about the outcomes from this case study is that at the VC, initial trainings for docents are orientations only, are not extensive, and rely on docents learning their practice from other volunteers and staff, as well as on the job. Therefore, the docents observed in this study have little to no formal training on good interpretive practice, and what they have learned in terms of practice is grounded in the context of their interactions with visitors. Also, their actions and activities have been shaped very much by the physical nature of the place they volunteer. That practice has

emerged as a result of those direct experiences with visitors and the docent community at large, and by means of sharing enterprise within their communities of practice. The site therefore breeds good environmental interpretation even without formal training. Because the docents are able to explain their choices of practice in terms of their experience with visitors and perception of roles, responsibilities and goals, the outcomes suggest that the folk psychology of docents in terms of practice is valuable and that good interpretive practice is not only inherent in docent practice, but common sense to those that implement it. Such a notion is significant because this can take us a step further in our thinking around designing docent professional development that works towards more effective communicating of science and conservation messages in science-based museum settings.

Implications and Significance to the Field

Petite Generalization

As described in the methodology, the goals of this study were to generate theory in terms of unpacking docent practice, not by providing a rich description of each docent involved, but to pragmatically identify patterns in docent practice as a means to aid future research. Therefore, as a naturalistic case study, it is not appropriate to attempt to generalize the grounded outcomes uncovered as a set of generalizable results to other museum or informal science learning settings. In short, the outcomes offer the possibility of drawing attention to conversations about the state of current docent practice in these settings, the significance to thinking about docent professional development, and to

discuss the relevance of these findings to the larger context as a form of petite generalization (Stake, 1995), an approach also found in design-based research (Barab & Squire, 2004).

As a way of gauging such petite generalization, the member checks that took place once analysis was completed uncovered that similar docent communities agreed that the claims about practice were coherent and present in their own settings, and were able to communicate similar explanations for practice, as well as sources of learning as those uncovered by this study. The theory generated therefore made sense to other docents outside of the VC. As examples, the urchin hug “hook” activity was used and understood at both locations. Participants talked extensively about encouraging visitors to touch live animals and interact with exhibits, and both communities strongly believed they learned their practice “on the job” (i.e. via each other, other staff and on the floor with visitors). The Californian aquarium participants did however note that they answered more questions than asked (potentially as a side effect of the sheer difference in visitor numbers between the VC and the larger institution), and that policing exhibits was not as significant as the claims portrayed, despite them describing part of their role as managing visitor and animal safety.

Although it is important to consider the differences in level of professional training of these additional communities to that of those in this study for future analysis (both had more extensive and required initial trainings), these member checks demonstrate there is scope for similar patterns in docent practice and learning to be

observable in similar museum settings. Subsequently, I would recommend research on docent practice to be extended to a broader scope of settings.

Interpretive Practice Emerges from the Community of Practice without Formal Training

The outcomes of this study have a number of potential implications for the larger field of museum education and interpretation. Here, the question arises that if docents are already in the process of engaging in good interpretive practice linked to place, what does this mean for future professional development activities for docents? The outcomes suggest there is scope for museum settings to realize the extent to which good interpretive practice already plays out via their docent communities, as well as the significance of the folk psychology via reflective practice those communities gain surrounding practice as the result of interacting with visitors. The outcomes also imply there is a high linkage between place and practice, whereby docents were explicit about their understanding of how visitors respond to their VC experience, and could adapt their practice in the context of the VC. Here, there are opportunities for training practices that help docents both identify their practice as good interpretive practice, as well as refine that practice with further training, an idea which centers on museum settings embracing the docent practice that is already taking place.

What is also interesting about these outcomes is the possibility that “floor” experience with visitors is equally as valuable as training, which again aligns with Grenier’s work (Grenier, 2008; Grenier, 2009; Grenier & Sheckley, 2008) but also the findings from an aquarium training evaluation centered on docent self efficacy completed

by myself and Shawn Rowe (2010) that suggested docent floor work was as impactful on docent beliefs about their practice as the training program itself. The development of folk psychology in terms of docent practice is something I therefore highly suggest as theories for future testing. We know that formal trainings are valuable for docents (Abu-Shumays & Leinhardt, 2002; Castle, 2006; Grenier, 2009), and we have suggestions for integrating formal, informal and incidental docent learning in professional development for docents (Grenier & Sheckley, 2008) as a means to embrace informal and incidental learning as the predominant influence on docent practice (Dover & Rowe, 2010; Grenier, 2009).

What this study suggests is that such moves in docent professional development design require understanding the extent of *existing* docent practice so docents are not only aware of how their practice is aligned with theoretical ideas of good interpretive practice, but that practice can be refined to suit the needs of the museum setting involved. In light of the linkage between docent practice and the setting and in an effort to improve effective science communication and/or conservation message delivery, docent professional development programs may therefore benefit from being directly responsive to the interpretive activity that takes place on site. In essence, there cannot be a “one size fits all” mode of docent professional development, and training programs may not transfer from one museum docent program to another. In consideration of professionalizing the museum education field (Tran & King, 2007), this requires the field to offer better support for docent managers in terms of unpacking the docent practice already taking place at their site.

In consideration of theory around interpretive practice in museum settings, the results of this study also highlight the value of having a greater understanding of perceived identity and role of museum docents in the context of communicating science. Here, docents in this study were able to articulate their decision-making and choices for practice in the construct of who they believed they were as educators and learners, as well as the roles they believed they played in the museum setting. These conversations were aroused by opportunities to reflect on their practice, and illustrate an example of where reflective practice for informal educators can not only encourage better self-evaluation of those educators as a move towards more effective practice (Ash & Lombana, 2012), but also inform the field of how practice is developed and reasoned by those communities. Such information is necessary to understand how interpretive practice is aligned with the educational goals of museum settings, as well as promoting public environmental and/or science literacy. The information is also necessary for understanding how the perceived identity and role of docents influences the choices they make for practice and, in the context of volunteers, what this means for both recruiting and managing voluntary docents. In essence, we cannot hope to move forward in our thinking around implementing effective science communication in museum settings if we do not first uncover what practice already exists in these settings and how it came to be. Effective professional development for informal educators as a whole requires an understanding of those educators' perceptions of practice in terms of identity and role in order make suitable choices for training and enrichment activities.

Although docents contribute significantly to the educational practice of museums, our prior research and understanding of this contribution is extremely limited. Such gaps in research hold a variety of implications for not only understanding professional learning of docents in museum settings, but also in developing more effective professional development practices for docents and informal educators as a whole, particularly in how those practices influence a museum's ability to meet educational goals. What is compelling is why the educational field seemingly understands so much about the practice and professional development of formal educators, and yet so little with informal educators, despite our growing understanding of how, what and why people learn outside of formal schooling. As a result, informal education research is really only scratching the surface in terms of what we need to understand about informal educators. Thus, this study is another move to increasing interest and awareness of the value of research on docents, which is vital to improving the research landscape on informal educators and visitor learning as a whole. The outcomes of this study add to the larger picture of theory surrounding the practice of informal educators as a whole not only by documenting practice taking place, but by explaining those practices from the perspectives of the docents themselves using reflective opportunities.

Reflections on the Study

Modeling Reflective Practice

What this study provides is some interesting insight into the mechanics of docent practice, and why docents choose to implement it based on their experience. Being a

grounded case study allowed patterns to be identified and detail on docent practice to be gathered from the docents themselves in a reflective way. The study is in itself a model of why reflective practice is important in the professional development of informal educators as well as understanding their practice. During member checking with the primary docents involved in this study, docents placed value on having the opportunity to observe and reflect on video of their own practice. In essence, their deeper understanding of their own interpretive practice was gained because I simply asked them about it. If we are thinking about understanding practice as a means to improve practice we cannot rely on our assumptions as researchers and practitioners about what is taking place. We must attempt to gain insider information about it from key informants.

Video Capture via Smaller Technologies

Another strength of this study was the method of collecting video observation. Using looxcie cameras as a new technology proved fruitful in attempting to capture video data in a more naturalistic way and with less intrusion on the docent-visitor interactions. Although there was a small trade off in video and audio quality in turn for more the more intimate “visitor-eye-view”, all docents noted they forgot they were being recorded and were able continue interactions with little distraction of the cameras. There were only two observations collected where docents specifically noted the camera to the visitor; otherwise, they generally explained that they were simply too busy doing their job to notice. Similarly, 84% of visitors noted they were comfortable with the cameras. A third of them explicitly remarked they had forgotten they were wearing it. Feeling self

conscious and the camera becoming uncomfortable whilst wearing the camera were limitations to using the cameras, but reported in the minority. As a means to provide information around whether different demographics of visitors were more likely to agree to wear a camera, I collected similar survey data from visitors during the data collection period who were not asked to wear the camera. Appendix A shows there were many similarities between visitors wearing cameras, and not wearing cameras, suggesting that particular groups visiting the VC are no more partial to agreeing to being recorded than any other. There is however, no way to deem whether different groups of visitors are more partial to taking part in research studies in museums as a whole, and in reality, there is no way to remove the influence of the presence of a video camera.

With today's camera technology becoming progressively smaller, lightweight and better quality, this study exemplifies the broad applicability of using personal cameras for museum research, as well as for evaluative purposes. Interestingly whilst collecting data, one gentleman took it upon himself to provide a running commentary of his visit and the exhibits as he walked around the VC wearing the camera. Such an example suggests the capacity to which these relatively inexpensive wearable cameras can be used to gather in-the-moment reflective reasoning and/or practice alone, from either educator or visitor perspective. Further work could place the looxcies on the docents to monitor visitor response to their practice.

Further Work

In light of the scope and limitations of this study, there is a great deal of work still to be done to understand not only docent practice in museums, but also its relevance to both docent personal and professional learning and impact on public science learning as a whole. This study points forward to uncovering greater detail about docent-visitor interactions and their implications for science learning in museums. In line with Grenier's (2009) ideas around docent professional development, the study also highlights the necessity to understand our docents better so museums make the most of their educational opportunities. We cannot begin to understand the museum's influence on its visitors in terms of free choice lifelong science learning if we are lacking understanding of the very frontline that interacts with those visitors.

There of course limitations to this study. Firstly, as I have mentioned, the grounded approach here is not meant to predict how docents across the museum field interpret science to the public, but it is meant to provide some starting ground for hypotheses testing around docent practice. There are a lot of interesting questions, and one that was not possible in the scope of the study: the influence of docent practice on visitors. This is a big question, particularly in regards to how we in the free-choice learning determine "influence", but it is an important consideration because docents are put in place specifically to influence the visitors. It would be fruitful to begin to understand how the interpretive practice of docents changes the learning experience of visitors, if at all.

Secondly, this study was limited by time, and data collection only occurred over several months. When we are talking about docent populations where participants have spent several years in a docent role, we need to start having a conversation about how docents' experience, learning, training and practice changes over time. Hence longitudinal studies of docent practice are important. There are also large seasonal differences in visitor populations at the site involved in the study, and more work across the year to specifically target a wider range of visitor groups as well as how docent practices might be shaped by conditions of crowding, ratio of school group visits to family visits, etc. are ripe for further study.

Thirdly, more cross-case work is necessary, and on a larger scale. Here, some investigation in to similarities and differences between museum docent populations and/or novices and experts in those settings needs to be explored. Further comparisons between populations are important for understanding the extent to which docent practice is related to its setting, and helps answer the question of whether transferability of docent professional development practices is or isn't useful. In relation, more structured analysis featuring a breakdown of each activity system via activity charts may be useful for helping more extensively unpacking the collective meaning making process of docent practice (i.e. the socio-historical components of that practice) and add another dimension of reflective practice and analysis by means of helping participants co-analyze the data.

Lastly, there is the notion of docent role and identity. If we are to continue thinking about docents in terms of communities of practice and mediated action, then we must consider how role and identity of those docents come in to play. There was some

suggestion in this research that perceptions of role, and how the docents identify as learners and practitioners can a) cause uncertainty in what practices are best practices from their perspective and b) how they choose to practice in light of what is expected of them at the institutional level. Understanding the differences between the role docents perceive they play in the museum verses what museum managers perceive is an important concept, as disconnections between these perceptions could influence the overall effectiveness of a docent program, or indeed the educational mission of the museum.

The research described in this study was a journey that allowed me to consider the deeper possibilities of interpretation and the development of docent expertise, as well as what this means to the larger field. All in all it is hoped this research will prove useful to better understanding the work of docents in museums. In completing this research, I have been lucky enough to work with a group of informal educators who I believe are fine examples of the millions of volunteers out there who work in museums, and I hope my work can be of value to them as well as the field at large.

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APPENDICES

APPENDIX A

DEMOGRAPHICS OF VISITOR PARTICIPANTS

Attribute		Wearing Camera			Not Wearing Camera		
		Male	Female	Total	Male	Female	Total
Sex							
Total		26	42	68	10	22	32
Age Range	18-24	0%	14%	9%	0%	5%	3%
	25-34	19%	14%	16%	0%	33%	23%
	35-49	19%	17%	18%	50%	33%	39%
	50-64	31%	24%	26%	33%	14%	20%
	65+	31%	31%	31%	22%	14%	17%
Education Level	High school diploma or equivalent (e.g. GED)	8%	19%	15%	11%	14%	13%
	Some college credit	19%	14%	16%	22%	19%	19%
	Technical training/Associate degree	12%	5%	7%	22%	29%	25%
	Undergraduate degree	38%	29%	32%	11%	19%	16%
	Graduate degree	23%	33%	29%	33%	19%	22%
Race	Asian or Asian American	4%	2%	3%	0%	0%	0%
	Black or African American	4%	0%	1%	0%	0%	0%
	European or European American	0%	9%	6%	44%	0%	14%
	Hispanic or Latino	0%	5%	3%	0%	0%	0%
	Native Alaskan	0%	0%	0%	0%	0%	0%
	Native American	7%	2%	4%	0%	0%	0%
	Native Hawaiian or Pacific Islander	0%	0%	0%	0%	0%	0%
	White or Caucasian	78%	81%	80%	56%	100%	86%
	Prefer not to answer	7%	0%	3%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%	

² Lead members of visitor groups were the adult in each group wearing a camera and/or responsible for completing surveys

Table 7 Continued							
<i>Demographics of Lead Members of Visitor Groups Involved in the Study</i>							
Attribute		Wearing Camera			Not Wearing Camera		
Sex		Male	Female	Total	Male	Female	Total
Total		26	42	68	10	22	32
Annual Household Income	Less than \$20,000	8%	11%	10%	0%	11%	7%
	\$20,000-\$59,999	25%	35%	31%	22%	42%	36%
	\$60,000-\$99,999	33%	38%	36%	44%	32%	36%
	\$100,000+	33%	16%	23%	33%	16%	21%
Most Recent Visit to VC	During the previous 12 months	12%	5%	7%	0%	10%	7%
	More than a year ago, but sometime during the last 5 years	15%	7%	10%	33%	24%	25%
	More than 5 years ago	15%	21%	19%	11%	14%	13%
	First Time	58%	67%	63%	56%	52%	56%
Visits to Similar Sites	More than once per month	12%	10%	10%	0%	0%	0%
	More than once every 6 months	23%	32%	28%	11%	14%	13%
	More than once per year	38%	17%	25%	67%	33%	44%
	Less than once per year	27%	41%	36%	22%	52%	44%

APPENDIX B**PRELIMINARY INTERVIEW QUESTIONS**

1. Can you describe your professional background? Probe: What do/did you do for a living?
2. How long have you been volunteering as a docent at HMSC?
3. Why did you initially decide to volunteer at HMSC?
4. Do you volunteer anywhere else? Probe: Where?
5. What do you think your role is as a docent at HMSC?
6. What do you think are your strengths as a docent?
7. What do you think are your weaknesses?
8. Do you enjoy being a docent? Probe: Why/why not? Are there times when you don't enjoy being a docent?
9. How does your work as a docent relate to other things in your life? Probe: Why/why not?
10. What do you think visitors learn when they visit the HMSC visitor center? Probe: Why/how?
11. What sort of role do you think you play in that learning? Probe: Can you tell me more about that/give me an example?
12. Where are you most likely to interact with visitors in the visitor center? Why is that?
13. What are some of the things you do and say when you interact with visitors in the visitor center?

14. What are some of the things visitors do and say when you interact with them?
15. How do you think you make decisions about the ways in which to interact with visitors? Probe: Do you have goals for your interactions or for what the visitors learn from you?
16. Do you feel valued by visitors? Probe: In what ways do/don't they value you? In what ways do they show that?
17. What sort of things have you learned whilst volunteering as a docent at HMSC?
Probe: What/Why/how?
18. Do you feel you continue to learn as you continue to volunteer as a docent? Probe:
Why/how?
19. How did you learn to be a docent and interact with visitors?
20. What do you think helps your learning as a docent?

APPENDIX C

POST-OBSERVATION GUIDE FOR RESEARCHER

Interviews will involve playing back each docent's individual video clips of their practice. Between clips, the researcher will probe discussion around:

- a) What was happening in each clip
- b) What practices the subject feels they partake in with visitors
- c) The action and discourse within those practices observed
- d) Subject reasoning and intentions for the observed practices
- e) Why they think they choose those practices
- f) How they feel after observing their own practice
- g) Whether they feel they would change anything about their practice

Procedure:

- Explain what you did and what you have to show them – “highlight reel” – remind them that this is not an assessment or an evaluation, but simply a conversation about what they do
- Watch the clips individually allow the participant to look at all the footage
- Ask what their initial reactions are and how they feel about watching themselves and the interactions
- Explain we will now watch each clip separately and will look more closely at the interactions. Have them try to explain what is happening in each clip. Probe common practices, techniques, visitor actions, types of conversations that go on. Also probe why they think they did what they did. Also ask if they think any learning is going on here.

- Once all clips are watched, ask if they feel these clips are good representations of their practice and/or interactions. Is there anything abnormal or missing?
- Wrap up by talking about how they feel now we have unpacked the interactions a little. Was anything a surprise? Would they change anything?
- Thank them for participation and give them their incentive bag! If consented for clips during focus group, double check they are still ok with this now that they have seen the footage.

