Chapter 3
Learning to Teach Newcomer Students Using Dioramas of North America

Maritza Macdonald, Roberta Altman, and Jay Holmes

3.1 Introduction and Framework for Course on Learning to Teach in Museums

This chapter illustrates a "learning to teach with dioramas" qualitative story by museum-based teacher educators. The chapter is organized into five parts: (a) an introduction providing the theoretical framework for learning to teach in museums, (b) "The Story" – a qualitative narrative of observations and conversations in the Hall of North American Mammals; (c) a curriculum-driven focus group; (d) the end-of-semester teacher projects; (e) and a profile of newcomer students in a New York City High School.

The ongoing educational needs and interests of most newcomer students in urban settings seem to depend on the mastery of a new language and on their abilities to get around their new city and its services in order to help their families adapt and survive. However, when they're faced with the pressure of learning academic content and obtaining a broad knowledge of their new country, additional resources and institutions can play a big role.

In response to the challenges of how best to provide opportunities to learn outside of classrooms and increase opportunities to learn, the cultural institutions in New York City have developed a variety of partnerships and fiscal arrangements to work with colleges, universities, and with other cultural institutions to support students, their teachers, and their families across the city.

M. Macdonald · J. Holmes (✉)
American Museum of Natural History, New York, USA
e-mail: mmacdonald@amnh.org; jholmes@amnh.org

R. Altman
Bank Street College of Education, New York, USA

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This chapter reveals the collaborative work of three museum educators who work at the American Museum of Natural History (AMNH). They have different areas of expertise. Macdonald is a teacher educator and researcher, Altman is an art and museum educator at Bank Street College, and Holmes is a science educator with expertise in geology and biology, who often co-teaches courses, develops professional development for teachers, and continues to explore the concept of place-based learning as applied to museum learning. This story is a composite of strategies and assignments for these museum-based courses over the past 5–8 years. AMNH offers these courses to teachers attending Teachers College at Columbia University, Barnard College, Bank Street College of Education, and Lehman College of the City University of New York. We also teach a course on Applied Research on Informal Science Settings for candidates attending the Museum's own degree-granting teacher education program (American Museum of Natural History 2016).

The methodologies for the courses and research on teachers learning in museums are based on two broad theoretical foundations: teacher knowledge and science learning in informal environments. In *Preparing Teachers for a Changing World*, Darling Hammond and Bransford (2005), summarize the extensive research on teacher knowledge base that comprises knowledge of students and community (who), knowledge of required content (what), pedagogical knowledge to teach the content (how); and teachers' beliefs in the importance of education for all. Similarly, we find that the National Research Council (2009) research summaries on learning science in informal environments highlights the importance of engagement and motivation, thinking and using tools of science, and identifying with the work of scientists. In addition, we have found that in this story we have had to use aesthetics and place-based learning strategies and perspectives to interpret our findings.

Considering these perspectives and our particular interest in newcomers to North America, we selected to use the Hall of North American Mammals. From its inception in 1869, the American Museum of Natural History has dedicated its collections, resources and research to educational endeavors. Exhibitions and Programs are designed to align with the museum's mission statement: "To discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe".

This exhibit has the potential of inspiring teachers' own motivations and helps them to explore how they may use it with students. We focused on single questions, such as, "How may you use this exhibit with newcomers to North America?" We thought there would be geographical, aesthetic, and scientific pathways to be discovered. The exhibit portrays regions from Canada to Mexico, including beautifully depicted boreal forests, deserts and grasslands; temperate, tropical and subtropical forests; tundra and snow covered mountains. We know that long-lasting personal connections can be made through the affective responses people have when viewing dioramas (Berleant 1992). The tradition of representing the natural beauty of the world, beautifully, has been part of AMNH's purpose and philosophy from the very beginning. Great care is taken to represent the settings within the dioramas with both stunning accuracy and exquisite care for subtle nuances. Artistry is combined

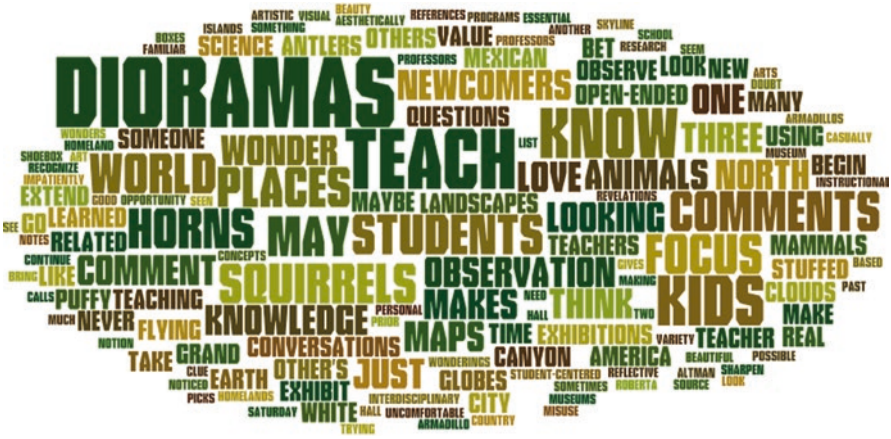

Fig. 3.1 Dioramas engage many thoughts and questions in the minds of learners

with scientific knowledge of the natural world to help people form memorable connections with the narratives of the dioramas (Fig. 3.1). For the viewer, this can spark a cathartic combination of scientific observation and feelings of wonderment and connection to this special and specific place.

The course introduces teachers to use museum-developed resources to supplement their teaching strategies and knowledge of content. For example, the Educator's Guides (American Museum of Natural History 2012b) are available online and in print. In the course, teachers use them after they have developed some of their own personal connections and ideas for using the exhibition with newcomers. By the time they visit the museum with their students, they will have maps of the exhibit and of the various dioramas to support their visit, and eventually, their projects. Each Educator Guide is organized around essential questions that can be explored in the exhibit. Some examples are, "Who are, and who were, North American Mammals? How does geography affect the continent's mammal diversity? How do mammals adapt to these environments?" Guides also include visuals of some dioramas, a list of 43 depicted species and their habitats, relevant glossary, maps of North American regions, additional online resources, as well as lesson suggestions for pre, during, and post visits. In essence, long-term and interdisciplinary projects are supported with these resources. There are two additional types of online resources that are part of the course of study. Documentaries on dioramas (Thirteen 2013, "Treasures of North America"), and Science Bulletins – a collection of short videos and visualizations designed to introduce the public to the work of scientist all around the world. For example, Yellowstone National Park is depicted in one of the dioramas and additional information is provided online. At the end of the course, we find that one teacher's student has specifically included this resource in their project (American Museum of Natural History 2012a).

3.2 "The Story": A Qualitative Narrative of Observations and Conversations

During the third session of the course, after teachers have done some readings on how we learn in museums, we invite them to do an open-ended walk through the Hall of North American Mammals. Their only guide or directive is to explore one question: "How or why may you use this exhibit with newcomers enrolled in Earth Science courses?" Instructors explain that while teachers are doing the observations and talking amongst themselves, the instructors will be taking notes of conversations to use in the planning focus group later in the course.

Typically, there are between 12 and 18 teachers and two instructors. The classes meet on Saturdays in fall or spring semesters. Each session is 5 h long for a total of six sessions – totaling 30 instructional hours. As we all walk to the exhibit and pass the bronze statue of Theodore Roosevelt, some stop to take pictures of themselves near the sculpture. Then we enter the Hall of North American Mammals. There seems to be some tension regarding the task and question. Firstly, the question does not mention mammals at all, and secondly, these teachers don't teach biology. At times they look confused or maybe a bit uncomfortable or unsure of how these dioramas will support their teaching of the Earth science curriculum.

This is a story from a particular Saturday in 2013. It begins with a teacher commenting impatiently, *"Why are we looking at these mammals? I teach kids from all over the world and I need to focus on Earth science concepts and content related to the Earth Science exams in this country."*

Others comment on the possible misuse of instructional time*, "My new immigrant city kids will never see these animals or landscapes."* Or, *"This would make sense if I was teaching social studies"*.

We respond casually with a comment, "*Today let's just observe the landscapes and begin to think about how regions may or may not be familiar to our students, or to us. Let's think of places we have been to or would like to go."*

These comments shift the focus from what we call a "deficit approach", which we witness in comments such as, "*my kids will never see these animals*" to original question of how may they use it with newcomers?

When she sees the diorama in Alaska, Laila wonders aloud without addressing anyone in particular, *"I would love to go to the Pacific Northwest coast. Look at these puffy white clouds. What a beautiful skyline, and so many small islands"*. Someone picks up on Laila's observations of beauty in nature and adds her own wonderings, *"Who makes these dioramas? Are they scientists or landscape painters?"* Another teacher says, "*Why do these dioramas seem to go so deep into the distance?"* Then someone calls the group over to the diorama of the Grand Canyon and says, *"I wonder how they painted the Grand Canyon so well. I was there when I was in college and it looks just like this diorama"*. In hearing these comments, we take note. We do not always comment, instead letting them share with each other. Later, in the focus group, we will surface these conversations to try to find unifying themes to aid in developing lessons or experiences for their students.

During the walk, we hear three different comments that provide us with the opportunity for further study into how dioramas help us reveal teachers' own prior knowledge and nascent knowledge of their students. *"Look at this armadillo, I bet some of my Mexican students will recognize it."*

Then three others continue this line of thinking, "*I bet you [that] my kids have seen squirrels in the park… but flying squirrels? I doubt it*." "*And look at these horns; I also noticed the horns in the hall of African Mammals. Are they horns or antlers?"*

A teacher asks, *"Are these animals real or stuffed? I think that I would love to have the time to teach kids how to make dioramas. My daughter made one in her private school using shoe boxes."*

The final teacher observation we record this afternoon gives us insight into how dioramas help them be reflective *"You know, I have never been to many of these places, I will have to sharpen up my own knowledge and get a good map of North America."* Someone else comments, "*Yes, maps and globes. I notice that some of my students love maps and are always trying to find their homelands on the classroom globes and world maps. Maybe they can teach me, and together we can list and extend each other's knowledge of places we know and places we want to know."*

3.3 Focus Group to Identify Themes from the Conversations

During the last hour of the day, we form a focus group. We use this methodology of qualitative research to look closely at the conversations to identify and create themes and categories (Fig. 3.2). These categories will serve to develop essential questions to plan museum trips, inspire projects, do web searches, and eventually, present their students' projects on North America at the end of the semester 2 months later. The value and research on conversations in museums (Leinhardt and Knutson 2004) has been a rich source of revelations about what we know, what we wonder about, and what we learn in the company of others while walking through exhibitions.

In our story, we found four themes that cut across areas of teacher knowledge. The first theme is areas of personal knowledge, such as places they have been to and others where they would like to go to in North America. A second theme focuses on artistic or aesthetic dimensions at the emotional or skills level: they note beautiful clouds, what type of professional makes these dioramas, how they are made so similar to the actual places. There are questions about the art of taxidermy or about the painting perspectives that make the dioramas look so deep into the distance. There are two additional themes: their students and curriculum planning. Under students we note the armadillo and the student from Mexico, and potential interests in globes and world maps. In curriculum planning we list: students teaching their teachers about places familiar to them or origin, reciprocal learning together about places in North America, teaching students how to make dioramas, and even learning about similarities and comparisons between North American and mammals in other continents. They now take notes. Work in small groups and agree on a variety of

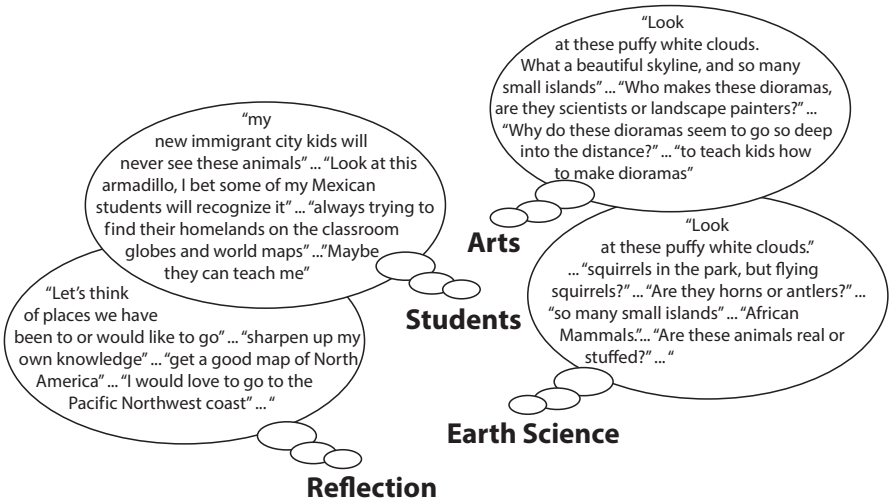

Fig. 3.2 In categorizing the of statements by participants we see overlap between our realms of the arts, students, reflection and science

projects and lessons related to the required visit to the museum. They decide to call their projects, "Expeditions to North America".

These combined methodologies of observations, conversations, objects, questions, and description are at the core of evaluation and research on learning science in informal environments (NRC 2009). In our case, the conversations resulted from open-ended questions and, in the focus group, we identified the themes that will guide their assignments. They will develop essential questions, visit the exhibitions with their students, develop plans for a 2 week project, and present these projects at the end of the semester. Another important linchpin to our findings about art and aesthetics reiterate Maxine Greene perspectives, "Aesthetic experiences are memorable for the sensory, affective, and enjoyable encounters they engender" (Greene 1978).

For instance, in the Wapiti diorama in the Hall of North American Mammals, a bull elk is bellowing into the gloaming dusk. The painted background – a faint pink sky and an emerging moon – captures ephemeral moments in time. In reality, this particular time of day lasts for only 15 min. When our students engage with the dioramas using an aesthetic lens, other realities emerge through open-ended questioning, such as "What do you see happening here? What makes you say that?" We ask the students to use evidence by 'reading' the details of the diorama. We can also ask newcomers, "What does this make you think of based on what you know about North American environments?" And, "Are there any connections to your homelands?" Such lines of questioning allow for a great diversity of responses that support many points of view. You don't have to be an expert to share the knowledge derived from personal experience.

Holmes, our co-author, is known for his visits to locations depicted in dioramas (Fig. 3.3). "You know, I have the same response to those scenes, I want to go visit

Fig. 3.3 The actual Timberline Diorama site at Logan Pass, Glacier National Park in 2007. The fact that the dioramas are of actual places allows us to bring in resources like topographical maps and considerations of human use and topics like climate change and the change of habitats. (Photo by Jay Holmes)

these places and explore them. I have managed to find several, you have this wonderful "déjà vu" experience, seeing the same mountains, plants, rocks and sometimes the animals and always new things to observe." Many of the dioramas represent parts of national parks and monuments, like the Mule Deer Diorama from the Devils Tower National Monument. The diorama includes some beautiful cirrus clouds, a river and the towering remnant of a laccolith. These are great elements for teaching about the water cycle, weathering and geology.

3.4 End of Semester Teacher Projects

At the end of the semester, teachers report on their work using the exhibit with newcomer students and how they developed projects. All teachers must report on his or her assignment to use the museum to teach newcomers about North America. They have called the projects "Expeditions to North America" and projects can be organized around questions in their own classrooms. The reports consist of three parts: (a) a the central focus or essential questions of their projects, (b) a PowerPoint that shows students at the museum doing observations; and (c) descriptions of projects that reveal interests in aesthetics, geography, and sciences. It is important to say that although their newcomer students may speak of a variety of languages, their instruction at the museum is done in English. At the museum, concept teaching depends heavily on their teacher's guidance and facilitation, the essential questions, the power of exhibitions at the aesthetic, scientific and geographic dimensions.

The nature of the projects and reports show that teachers have made use of various museum-developed resources beyond their visit to the museum. Using the term "expeditions" seemed to spark a variety of topics and interests related to expeditions. For example, some were interested in an expedition to Yellowstone following the reading of an assigned article entitled, "Yellowstone National Park is a Volcano", and scientists at work on "Yellowstone: Monitoring the Fire Below", the related

Science Bulletin on the subject of National Parks and volcanoes (American Museum of Natural History 2012c).

In the following three essential questions for "Expeditions to North America" projects we find some of the themes that emerged from their own students:

> Where do my favorite mammals live in North America?
> Why are there National Parks in North America and how many are near NYC?
> Are there similarities or differences between landforms in North America and other places we know?

There are other projects that are directly connected to the initial observation (Fig. 3.4). The teacher with the comment on the diorama shoe box that her daughter made in school was able to offer that experience to her newcomers. Her challenge was securing the materials. She got to see how creative students were in recreating the dioramas. They exhibited them in the school and showed a narrated introduction to families on family night. They recorded it on video and families asked for copies to send to extended family back home.

A focus question put forth by another teacher was, "*Where else would I like to go in North America and how would I travel there?*"

Some of the places students selected to research and visit were:

- Alaska
- to where the Bison roam
- to the tallest mountain
- to the mouth of the longest river in North America

Fig. 3.4 Student diorama by Ethan Glover Bailey depicting a Harpy Eagle with prey

These diorama-based research questions took about 2 weeks to research. The students then combined their research and designed a travel plan that included itineraries, factoring in travel time, and calculated costs for both air travel and AMTRAK train.

One of the most interdisciplinary projects was "*The Travel Agency"* in an eighth-grade classroom. The question posed was, "*Where would you like to travel around the world?*" Each student or small group of students was to identify a place they would like to visit and create a tour brochure. The PowerPoint showed the students at the museum. They were in the Hall of North American Mammals and also in the Hall of Mexico and Central America because there were several students from those regions. Other pictures showed the classroom arranged as a travel agency. The classroom was filled with samples of commercial brochures for Eco-Tours to many places. One of them was to Costa Rica to save baby turtles. Others focused on the cloud forests and butterflies. There were students from Costa Rica in his class, so the interest was high. They developed a bilingual brochure in English and Spanish. At one point, when discussing that Mexico had volcanic rock because there were many volcanoes in that area, one of the students from Africa commented*, I think Kilimanjaro is also a volcano*. As a result, this teacher hoped to expand the project – the development of a travel agency – to include tours to their homelands. However, since most of the students are in the United States because of political unrest and other trying conditions in their home countries, he decided not to take that direction unless it was suggested by the students themselves.

When he finished his presentation, several classmates (teachers) taking the course, asked him where he would like to travel with students. He answered without hesitation, "To Tortuguero in Costa Rica to help rescue the baby turtles from predators. I want my students and I to experience caring for an endangered species that we can hold in our hands and walk to the water for [the turtles'] first swim." This is an excellent example of how the students and their interests influenced their teacher. Their teacher had also expanded his use of the museum to include the Hall of Mexico and Central America to learn from his students what they would share from their places of origin. At some point in the course, we mentioned the idea of using a science hall and a cultural hall on the same trip whenever it seemed appropriate; and he had taken advantage of the idea based on his interest in the students' places of origin. Only in a natural history museum with science and cultural exhibits could this interdisciplinary expedition take place.

In summary, our interpretation of this story is that it depicts an example of place-based learning. We know that through the lens of place-based education, (Gruenewald 2008) people can become intensely engaged in a place they know intimately or the one they are viewing in a diorama. Such immersive interactions can, "…become a conversation about personal geography and our relationship to our island home, the homes we had left, and the homes we hoped to find" (Graham 2008). This journey with dioramas can provide a foundation for integrated teaching. Gruenewald (2008) states that, "A focus on the lived experience of place puts culture in context, demonstrates the interconnection of culture and environment, and provides a locally relevant pathway for multidisciplinary inquiry." For these reasons, we believe that this

course has evolved from the teachers as they work with the pedagogical framework of the course. Now, we will end the chapter by describing why we do this work: To welcome the Newcomer Students we meet in schools, such as the Newcomers High School in New York City, to the Hall of North American Mammals.

3.5 Newcomer Students: A School Profile

When we consider the reality of newcomer students to fulfill our institutional mission, we seek inspiration based on the needs of these students. One of these inspirational schools is the NYC Newcomers High School, located in the borough of Queens. In a recent visit in January 2016 with the school principal, Mr. O. Sarmiento, we learned that there are 50 countries represented and 31 languages.

The languages and origins of the students include Arabic, Bengali, Bosnian, Haitian Creole, and Hungarian; Indonesian, Korean, Malay, Greek, French, Spanish, Chinese, Nepalese, Urdu, Uzbek, Serbo-Croatian, and 15 others. One of our goals with the teachers of new immigrant students is to create learning experiences that they can replicate with their students. Students attending this school cannot have been in the country for more than 1 year. Their in-school curriculum includes instruction in native languages, followed by transition to bilingual classes, and then to English immersion.

In addition, the school has a strong arts department because while students are learning English they can express themselves and their knowledge through art. Paintings, drawings, sculpture, and photography adorn the hallways and offices. There are also organized expeditions to surrounding states to expand their urban experiences. More than 75% of its students achieve highly enough to enter college at the end of their high school years at Newcomers.

3.6 Conclusion

As teacher educators, the authors believe that we need more case studies of museum pedagogy for specific populations of students. These case studies or descriptive stories that reveal how teachers learn in museums, prior to teaching their students in museums, will be valuable. In summary, the salient themes for us continue to be teacher personal knowledge, pedagogical knowledge, perspectives on place-based learning, essential questions, and the three dimensional experiences with aesthetics, science or cultural content, and geographical knowledge when addressing the needs of newcomers.

3.7 Remembering Roberta Altman (1947–2017)

In memory of our dear friend Roberta Altman (1947–2017; Professor at Bank Street College of Education), a transformative educator who motivated all of us with her humanity and passion for life, arts, and museums. She was well known for her love to teach with dioramas and exhibits, which inspired her colleagues and students at museums, schools, and around the world.

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Dr. Maritza Macdonald is currently Senior Director of Education and Policy, and Co-director of the Masters in Arts in Teaching graduate degree program at the American Museum of Natural History, the first of its kind in the United States. During her 17 year tenure at AMNH, Macdonald has focused on teaching, research on the role of the museum in teacher education; partnerships with schools, universities, and museums – both in the US and overseas and being the Principal Investigator on a variety of National Science Foundation grants. Her international activities have brought her to multiple experiences in countries where social struggles have taken place. Through

these experiences she has developed her professional concerns between education and immigrant ion, peace education, and the role of museums in the preservation of heritage. These experiences include consultation with the Vietnam Museum of Ethnology in Hanoi, the National Research Foundation of South Africa, University of Amazonia in Colombia, and Ankara University in Turkey. Prior to joining the Museum Macdonald served as researcher and faculty on Teacher Knowledge for Urban Education, at Columbia University, Teachers College, where she still holds an adjunct faculty position.

Roberta Altman (1947–2017) was a professor and advisor in the Museum Education Program at Bank Street College of Education. She was also co-teacher in the Higher Education Programs at the American Museum of Natural History in New York City. Her particular interests included: Arts and aesthetics, Place Based Learning, Cross-cultural understanding, Developmental learning, Equity in education, and Global issues in education. Roberta was the recipient of the Niemeyer Chair Award from Bank Street College in recognition of her work serving underserved and marginalized children and families in New York City and in many cities in India where she served for 3 years in the Peace Corps. She had been an educator for 48 years teaching both children and adults.

Jay Holmes is currently the Senior Coordinator of Urban Advantage Professional Development at the American Museum of Natural History. Urban Advantage is a partnership between the Museum and 7 other science rich cultural institutions in New York City. UA helps teachers bring student centered science research to over 80,000 New York City middle school students. Jay designs and delivers professional development to teachers in areas of geology, ecology, evolution and genetics often incorporating the AMNH dioramas. Mr. Holmes joined the American Museum in 1992 as a lecturer for the special exhibit “Global Warming: Understanding the Forecast.” Since then he has been Coordinator of the Museum’s After School Program for high school students, and advisor for the Museum’s ecology club for teens, developed and implemented hands on activities for visitors in the Museum’s Discovery Room before joining the UA team in 2004.