 **Ocean Underwater Scene**
Dioramas of First Graders with
Submarine Porthole Views

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Introduction

This practical article describes a creative project focused on ocean reef life. First graders worked with preservice teachers (college students preparing to be elementary teachers) to create dioramas of sea life during an integrated unit on the oceans. The dioramas they made were created from cookie, cracker, or cereal boxes cut to open like a book and papier-mâché to make them stiff. The front flap or "door" had a clear plastic circular window set into it to simulate a submarine porthole. The inside of the box featured a reef with many handmade sea creatures. The back of the box had a lift-the-flap page glued to it that showed a photocopy of the underwater scene which identified and presented facts about the sea creatures. The side of the box showed food chains or food webs featuring the sea life. Some example first graders' dioramas are shown in Figure 1 and Figure 2.

This article begins with a review of current literature on the importance and benefits of craft activities in education, followed by an analysis of the benefits of dioramas as an educational tool and a review of the current global ecological situation as well as the role of education in improving this situation. Then, the undersea dioramas project is described in-detail, accompanied by an analysis of the experience of conducting the project and student work. Suggestions for replicating this project in the classroom are also included.

Abstract

Ecology education of the younger generations is vital for worldwide change of people's attitudes toward nature warranted by the current global ecological crisis. Yet, this goal needs to be addressed through age-appropriate activities that are educational and engaging. This practical article focuses on dioramas of ocean reef life made by first graders. This arts-integrated project served two main purposes: 1) education of primary students about ocean ecology and helping students realize their roles in saving nature 2) increasing student science content knowledge. Additionally, several other benefits of making dioramas emerged during this project, including highly creative student products, genuine interest in the topic of ocean ecology, and heightened levels of motivation and concentration displayed by the students during the project.

Key Words

STEM education, creativity development, arts integration, STEAM, ocean ecology, dioramas



Figure 1. Example first graders' underwater dioramas. The left column shows the front "door" of the diorama with the transparent porthole of a submarine in it. The right column shows the underwater scene inside the diorama and features organisms on a reef.

Literature Review

In this brief review of pertinent literature, the importance of craft activities for young students is first addressed. The students highlighted in this article are first grade students approximately 6 to 7 years of age who engaged in this crafts project. All teachers can benefit from the example of teachers in Finland who regularly integrate craftwork into their early childhood and primary level teaching to provide important skills and attitudes. Next, important skills addressed by creation of a diorama are discussed. Finally, the importance of ocean ecology education is examined with emphasis on the experience of ecology education through arts and crafts-integration in Finland.

Importance of Craft Activities for Young Students

The benefit of explorative activities, including play, in children's development and cognition has been recognized for a while (Piaget, 1962; Vygotsky, 1978). Arts and crafts, particularly in early grades, are grounded in exploration and play, not creation of artwork (NEA, 2004). Crafts and arts develop creativity and problem-solving skills (Koster, 2012). Interestingly enough, even elementary school students themselves see the importance of crafts. According to an extensive study, primary grade students see craft skills as most important for them personally (Mursepp & Kikkull, 2014). These researchers (Mursepp & Kikkull, 2014) also emphasized the significance of craft skills for the overall development of elementary and even secondary school students because, in addition to manual work, crafts require mental work. More precisely, arts and craft activities stimulate the development of fine and gross motor skills (Koster, 2012; Mursepp & Kikkull, 2014).

Finland currently holds one of the top ranks in regard to the level and quality of public education (National Center on Education and the Economy, 2015). Unlike many other countries, Finland recognizes the importance of craft education for the holistic development of students and even includes craft, in addition to art, as a distinct subject in the

elementary and middle school curricula (Rönkkö, Mommo, & Aerila, 2016).

According to Mursepp and Kikkull (2014), even students at the middle school level need concrete experiences such as craft activities. They are typically transitioning from a concrete operational stage of brain development to formal operational stages, and often oscillate between these stages (Powell, 2015), which necessitates including hands-on activities in middle school instruction.

Mathematics, once it begins to involve more abstract concepts, becomes less related to real life and less attractive to students. A study of middle schoolers who attended a school with mathematics lessons integrated with crafts demonstrated that this subject integration caused a positive change in student attitudes toward mathematics, facilitated connections between mathematics and other subjects, and improved student understanding of connections of mathematics content with real life (Kokko, Eronen, & Sormunen, 2015). It is safe to assume that if middle schoolers benefit from craft activities; crafts are also beneficial for elementary students who are typically at the concrete operational stage of development (Powell, 2015).

In the United States, crafts are combined and considered a part of arts education, mainly visual arts (NEA, 2004). Arts and crafts are student-centered in nature (Cornett, 2015); therefore, integration of crafts with other subjects can help make instruction more student-centered overall. The role of the teacher in craft lessons becomes closer to a role of a support and guide for students who, after having been introduced to the problem and materials available, have the freedom to take the lead, experiment, be creative and use critical thinking to achieve the goal (Rönkkö et al., 2016). Authors also indicate that this approach to teaching is most beneficial for teaching the 21st century skills, particularly because design is an inseparable part of craft process and involves utilization of critical thinking, creativity, collaboration, and other 21st century skills.





Figure 2. More first graders' underwater dioramas. The left column shows the front "door" of the diorama with the transparent porthole of a submarine in it. The right column shows the underwater scene inside the diorama and features organisms on a reef.

Student Skills Reinforced by Creating Dioramas

Dioramas are a well-known tool used in teaching biology (Tunncliffe & Scheersoi, 2010). Dioramas are effective because they include not merely a single object of study (e.g. a Siberian tiger), but a snapshot of the whole ecosystem with all its components, such as environment as well as relationships between the components (Tunncliffe & Scheersoi, 2010). Dioramas are considered an art form because the second purpose of them is to provide aesthetic experience (Metzler, 2007). Additionally, all areas of the Arts, including dioramas, are renowned for creativity development (Cornett, 2015).

This educational tool can be used to address the needs of diverse student populations without modification by directing student attention to particular aspects of the dioramas, avoiding the information that is already known or information that is not appropriate for the developmental level of particular students. This practice supports the premise of Vygotsky's concept of the Zone of Proximal Development (Vygotsky, 1978) if applied in the context of social interactions students are involved in while studying or creating dioramas. At the same time, dioramas allow exploration and self-directed study, which are instrumental in developing student creativity and thinking skills (Cremin, Glauert, Craft, Compton, & Stylianidou, 2015).

One of the premises of Constructivism is the importance of experiential learning, i.e. learning through doing and discovery (Bruner, 1960). Dioramas embody this idea. When creating dioramas, students are learning about particular systems (e.g. the Atlantic Ocean) through creating a physical model of the system and ensuring all its components and relationships between them are demonstrated. Involving students' multiple senses and accommodating different learning styles is considered one of the best practices in education (Powell, 2015). Creating dioramas involves movement, which develops small motor skills, and is helpful for kinesthetic learners. Dioramas are also appropriate for visual learners.

Reiss and Tunncliffe (2011) state that the skill of observation is vital for scientific learning and needs to be developed and practiced with students. Dioramas can be a valuable resource for development of this skill because they

do not rely solely on speech and writing (Tunncliffe & Scheersoi, 2010). Dioramas facilitate creation of narratives by viewers, which leads to making meaning of what is observed (Reiss & Tunncliffe, 2011). Dioramas can be considered a form of art/craft that helps communicate knowledge often hard to express using words (Eisner, 2008). A study by (Bull, et al., 2017) demonstrated that dioramas can be used to facilitate storytelling and consequently, communication skills in elementary and middle grade students. One study found that they can also be used for language skill development, particularly in early childhood-elementary settings (Kustiawan, 2017).

Spatial thinking skills are important for STEM education (Uttal & Kohen, 2012). Development of these skills can be accomplished through making dioramas. Students need to manipulate and modify various materials (e.g. modeling clay or paper) to create physical representations of elements of ecosystems and place them in a way that represents relationships with other components of the system.

Dioramas help develop critical thinking skills and inquiry in addition to classification, comparing, and measuring skills. Tunncliffe and Scheersoi (2010) identified several stages of interaction with biological dioramas: identify-interest-interpret-investigate. The classification, comparison, and measuring skills are employed during the identification-interest stages in which the viewers' preexisting knowledge is activated by viewing the dioramas and/or discussions with peers. The implicit narrative found in dioramas fosters recalling information, integrating it with new knowledge, and creating one's own new narrative(s) (Reiss & Tunncliffe, 2011). The latter two stages: interpret-investigate facilitate critical thinking and inquiry. The most advanced types of conversations dioramas facilitate include asking questions, hypothesizing and testing hypotheses (Reiss & Tunncliffe, 2011).

Importance of Ocean Ecology Education

According to the policymakers' national summary of the status of the habitat of US living marine resources, the ocean and its inhabitants are negatively impacted by humans and their activity (NMFS, 2009). The issues listed in the report include loss of natural habitat of many marine species of fish,

birds, mammals, and others because of water pollution and overfishing. Change in the salinity distributions due to changes in the amount of freshwater inflow caused by human activities affect the habitats of estuarine species. The ocean is polluted with garbage, particularly plastic waste, oil spills, and other chemicals, which causes destruction of the habitats of not only marine life, but species who spend parts of their lives in fresh water. Global warming caused by increased emitting of greenhouse gasses, is not only endangering the aquatic species per se, but also increases and accelerates the negative impact of all previously mentioned issues. The problems revealed in the report are pressing and require urgent attention. For example, the increase in ocean acidity levels is expected to accelerate and produce damaging outcomes within the next few centuries. Prior to the intensification of humans' impact on nature, this increase would have taken few hundred million years to occur (NMFS, 2009). Higher ocean acidity levels will likely endanger corals and mollusks by dissolving their shells and skeletons.

Human influence is not limited to pollution and climate change; our activities, such as geophysical exploration or even the high ship traffic increase the noise levels in the oceanic environment, which can also have a negative effect on nature. The report also raises an issue of lack of protective efforts from the governments. For example, "... only 1 % of the ocean within U.S. jurisdiction qualifies as marine protected area, and only about 10% of that carries the highest level of protection, where fishing and other extractive activities are precluded" (NMFS, 2009, p. 19).

The current global ecological crisis calls for a global change in values and attitudes toward nature (Zeber-Dzikowska, Chmielewski, & Wojciechowska, 2016). Education plays a vital part in this change because of its profound influence on people, particularly young generation, who will inherit this Earth.

Zeber-Dzikowska et al. (2016) describe the main purpose of ecology as exploration of connections between living organisms, including humans, and the environment. Ecological or environmental literacy resulting from this exploration has an affective component that drives environmentally-responsive behavior of individuals (Simmons, 2001). Such behavior is based on people's ability to predict

the effects of human actions on the environment (Zeber-Dzikowska et al., 2016) and a clear understanding of self as a part of the global ecosystem where all components affect each other (Anderson & Suominen Guyas, 2012).

Although humans do not always realize it, even the existence of humanity depends on nature and the resources it provides. People tend to believe that a most recent gadget or new fashionable shoes are what they need to raise their quality of life. We forget that the waste generated from mass production of new goods and discarding old items is destroying nature, which already started affecting the quality of human life through polluted water and air, to name a few. Only a few decades ago, the idea of purchasing bottled water instead of using tap water would have seemed ridiculous.

The oceans form one of the most important and influential components of the global ecosystem; in fact, 75 % of the Earth's surface is ocean. Present day large corporations have no incentives to address the issues of pollution, exploitation, or overfishing and generally tend to have a consumerist attitude toward nature (Anderson & Suominen Guyas, 2012). Therefore, ecological education of future generations is vital. However, unfortunately, in today's school curricula, ocean ecology concepts are barely present (Hoffman & Barstow, 2007).

One of the goals of art education is helping students develop values for integrity, responsibility, and other personal values (Anderson & Suominen, 2012). However, art education does not involve imposing values on students, it involves inquiry and experiential learning of important concepts and issues in a safe context. Creative inquiry, as the core part of the arts, involves critical thinking, questioning, discovering and using evidence to support one's point of view (Cornett, 2015, p. 149). Therefore, studying the pressing ocean ecology issues through art seems like one of the best approaches. After all, the motivational, relational, and educational benefits of arts-integration have been known for a while (Cornett, 2015).

Human treatment of nature is affected by aesthetic appeal (Carlson, 2007); i.e. if one perceives a certain scenery as "beautiful", he/she is more likely to want to protect it from being turned into a parking lot or other human influence.



Works of world-famous artists such as Van Gogh depicted natural scenes that an average person would not necessarily describe as beautiful or magnificent. For example, Van Gogh's painting called *Mulberry Tree in Autumn* (VanGogh.Net, 2009-2019) includes a seemingly ordinary tree and its surrounding area; yet, when people look at the artist's work, they are able to see this ordinary scenery through the eyes of the artist and discover that ever present beauty.

The relational benefits of the arts described by Cornett (2015) are not exclusive of relationships between people. They include relationships between humans and nature as well. Relationships between people can strongly affect our behavior because usually, one cares for those with whom one has relationships. This relational power of art can be channeled into helping students "build relationships" with nature and adopt a caring and respectful attitude to it.

Dioramas constitute an example of an arts-integrated activity and a great tool for ecology education. They mirror not only the biological components and their interactions within the system, but the environmental changes happening over time (Tunnicliffe & Scheersoi, 2010), which is not only a tool that scientists can use to make informed decisions about an ecological problem at hand, but a tool that can be used to teach students about these environmental issues and changes. By making dioramas representing ecosystems and issues related to ecology, students are engaged in active learning and internalization of the new knowledge.

Art has been used as means of communication, expression of thoughts, feelings and ideas for ages. In fact, art is often referred to as a language people use to express what cannot be expressed in words (Cornett, 2015). We often look at works of art inspired by historical events or issues, for example photographs of Holocaust survivors or monuments devoted to cancer survivors, and feel the pain of those people with a sudden realization of the infinite value of life. Through triggering a concert of feelings in us, works of art make us reevaluate our reality and priorities, remind us what really matters, and make us see that our actions as individuals matter. This makes connecting art education and environmental education the next logical step to take at

schools if we want to raise a generation of conscientious people who care about nature.

In Finland and some other Scandinavian countries, environmental education has long been tightly connected with art education. In fact, art-based environmental education is an important part of the school curriculum there (Pohjakallio, 2007).

We often forget not only that humans are a part of nature, but that humans are also animals. Even in our daily speech, we oppose humans to nature or put ourselves above nature for example when we say that a mountain was concurred by a certain traveler. Pohjakallio (2007) explains that the main premise of art-based environmental education is the mutually influencing relationship of humans and nature. This approach to environmental education emphasizes the view of humans as a part of nature rather than a user or consumer of it. The term "teaching through arts" refers to the highest degree and quality of arts integration in which arts are used as means to teach another subject (Cornett, 2015). The same idea lies behind the success of art-based environmental education in Finland, where art is not the goal of art-based environmental education, but a part of the educational process Pohjakallio (2007). The 2018 Environmental Performance Index (EPI) supports the idea of importance of environmental education: Finland is ranked 10 out of 180 countries, when the United States is ranked 27th (Yale Center for Environmental Law and Policy, 2018). The undersea dioramas project described in this practical article combined the main components reviewed from the literature: craftwork in making an ocean reef diorama and raising of ecological awareness of youth.

The Undersea Diorama Project

This diorama project had many facets and was a collaboration between preservice teachers of a curriculum class and first graders at a nearby elementary school facilitated by university faculty and the classroom teachers.



Preservice Teachers' Work

Several sections of an undergraduate junior-level college class focused on curriculum design. The professor of that course coordinated with the first grade teacher to provide a practicum experience for the elementary education college students (preservice teachers) and a complex art-integrated science project for the first grade students. Assignments and practicum work connected to this project were only a part of the learning involved in the college course. Similarly, the first grade teacher used the sea life thematic unit across the

curriculum although preservice teachers were involved only in the science –art components. Small groups of preservice teachers planned and delivered lessons to small groups of first graders. The first grade classroom visits occurred during the preservice teachers' regular college class times. Some small group lesson planning time was also provided during the curriculum class.

The main components of the undersea curriculum projects for preservice teachers are shown in Table 1. The dioramas are the principle focus of this article and so other components of the lessons are only briefly discussed.

Table 1. Main Components of the Undersea Curriculum Project for Preservice Teachers

Component	Explanation
1. Sea life craft with step-by-step instructions for making it	Each preservice teacher chose one sea creature from a list of reef organisms on which to focus. The same organism was used by a particular preservice teacher in components 1, 3, and 4. Each small group of first graders and preservice teachers was introduced to several reef organisms. Preservice teachers made pictorial step-by-step directions for making the crafts.
2. Example diorama made by preservice teacher and gessoed base for student diorama	These completed example dioramas were shown to first graders to inspire them. Preservice teachers worked in small groups and taught each other how to make their craft organisms. Later, these same groups formed somewhat large groups with the addition of a few first graders. The first graders' dioramas could vary from those of the preservice teachers as long as they each had the required components (completely painted diorama, reef, craft organisms, food web or chain, lift-the-flap information page on the back and title). Preservice teachers made the basic papier-mâché covered and gessoed diorama box for first graders because of time constraints in the first grade classroom.
3. Card set of 10 photos each with a fact about one sea organism on the reverse	These sets were used in small group lessons to increase the knowledge of students for reef organisms. Each preservice teacher made one set with information researched about the organism, reworded in language a first grader could understand.
4. Step-by-step instructions of how to draw a specific sea organism using simple geometric shapes	These drawings were used to make the food webs and to decorate blank parts of the dioramas. Drawing a recognizable image of a sea creature provided students with a sense of accomplishment and taught the student to use observation of forms in drawing.



Preservice Teachers' Ocean Organism Crafts.

Figure 3 and Figure 4 show example pictorial sequences for making an octopus and a starfish. These were made by the college professor and used as examples for the preservice teachers. Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, and Figure 10 show many example crafts designed by preservice teachers.



Figure 3. Steps in creation of an octopus from the corner section of an aluminum foil pastry pan. 1. Cut out a corner section from the pan with a balloon-shaped area from the floor of the pan. 2. Cut eight slices into the balloon. These will become the arms of the octopus. 3. Use a pen to score each arm to make it three-dimensional, 4. Twist each arm. 5. This image shows all arms twisted. 6. Begin shaping the octopus body form. 7. Bend the arms into different positions. 8. Crunch down and shape the octopus head. 9. Spray paint the octopus with a neutral color. 10. Add eyes with a marker.

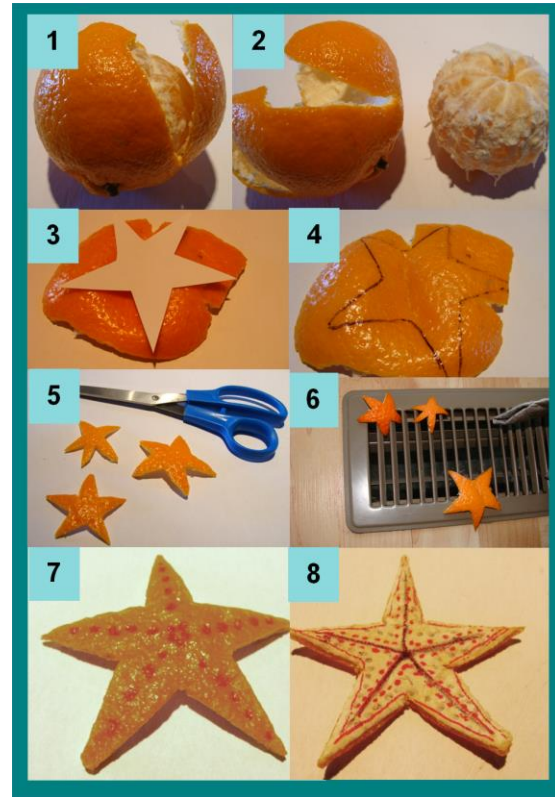


Figure 4. Steps in creation of a starfish from a tangerine skin. 1. Begin unpeeling a tangerine. 2. Try to keep the skin intact. 3. Gently flattened the skin and position a star-shaped pattern. 4. Trace the outline of the star. 5. Use scissors to cut out the star. 6. Allow the flattened star to dry. Stars are shown on a floor vent. 7. Use a red marker to create authentic markings on the top of the skin. 8. Turn the starfish over and use the red marker to make details on the underside.



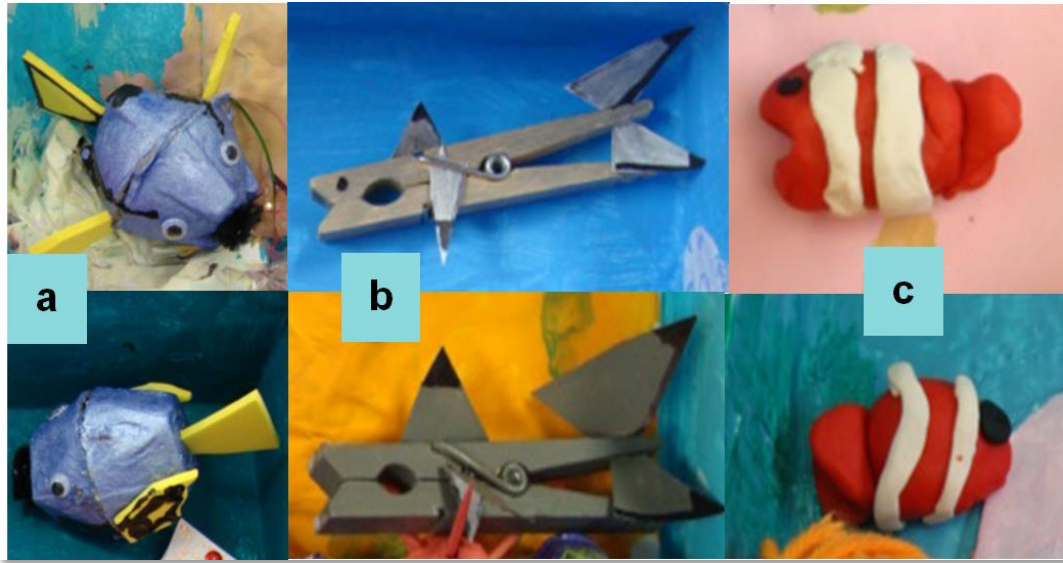


Figure 5. Example craft sea creatures designed by preservice teachers. a) Blacktipped Reef Shark, designed by Ashleigh Schweska, made with a painted clip-type clothespin and index card fins. b) Blue Tang Fish, designed by Ashley Odneal, made with two glued-together sections of an egg carton painted metallic blue with yellow craft foam fins and pieces of a green chenille stick. c) Clownfish, designed by Meredith Murray, made with white and orange Playdoh.



Figure 6. Example craft sea creatures designed by preservice teachers. a) Dolphin, designed by Erica Daugherty, made with cardstock paper coated with colored sand and glued-on glass seed beads. b) Harlequin Shrimp, designed by Stephanie Mangrich, made with fabric-covered wooden craft sticks, chenille stem pieces, googly eyes, and painted spots. c) Parrotfish designed by Katie Pruikmsa, made with cardboard, wadded colored tissue paper, and a googly eye.



Figure 7. Example craft sea creatures designed by preservice teachers. a) Sea Urchin designed by Peter Larson, made with colored Play-Doh with colored toothpicks. b) Seahorse designed by Lauren Wayman, made of craft sheet foam, glitter, chenille stick pieces, and a googly eye. c) Sea Slug, designed by Nicki Gerlach with a Styrofoam ball, chenille stick, and colored yarn.

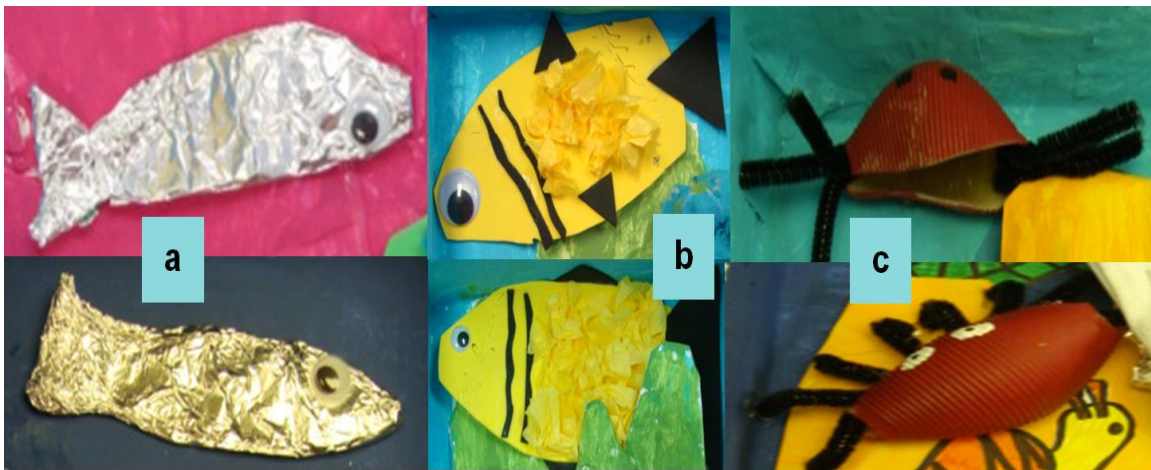


Figure 8. Example craft sea creatures designed by preservice teachers. a) Silverside Fish, designed by Cayli Garrett, made with a piece of cardboard covered in aluminum foil with an added googly eye. b) Butterfly Fish, designed by Malinda Bartels, made with origami-style folded yellow paper, black marker, and a googly eye. c) Crab, designed by Colleen Gould, made with a painted jumbo pasta shell and glued-on chenille stick pieces.



Figure 9. Example craft sea creatures designed by preservice teachers. a) Lionfish, designed by Becca Lord, made with white foam board, orange tissue paper, whiteout, black marker and a googly eye. b) Eel, designed by Sarah Buckingham, made with the corrugated rim of a paper plate and crayons. c) Loggerhead Sea Turtle, designed by Emily Baltus, made with a brown tissue paper covered egg carton and craft dough legs.

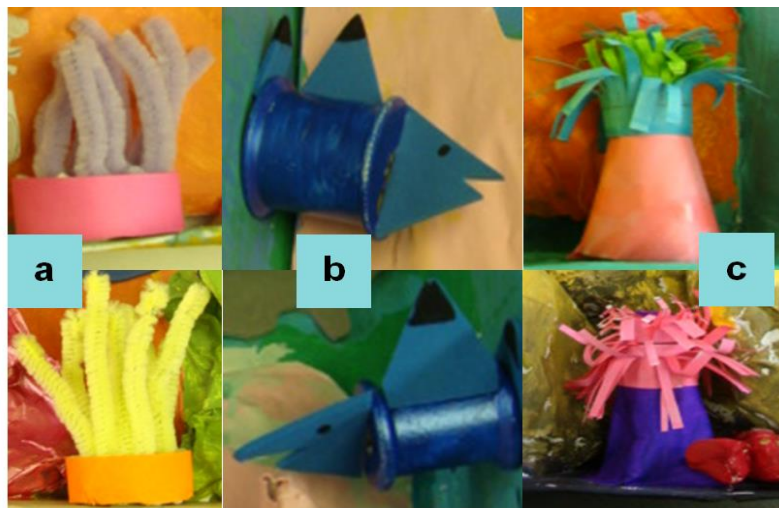


Figure 10. Example craft sea creatures designed by preservice teachers. a) Sea Anemone, designed by Jenny Weber, made with a plastic bottle cap with drilled holes and chenille stick pieces. b) Blacktip Reef Shark, designed by Krista Kirsch, made with a painted wooden spool and pieces of craft sheet foam. c) Sea Anemone, designed by Holly Bruesewitz, is made from colored cardstock and tissue paper.

The Main Parts of the Diorama. The diorama was basically a papier-mâché-reinforced food product box (cracker, cookie, or cereal box) that was designed to open like a book. The papier-mâché-consisted of torn pieces of recycled copy paper carefully glued with white craft glue to cover and strengthen the box. The papier-mâché-covered box was painted with white gesso to stiffen the box and to provide a good surface for later painting. The preservice teachers each made a diorama box for themselves and also created the papier-mâché unpainted boxes for the first grade students because of classroom visit time constraints. The preservice teachers inset the circular porthole window (usually a hummus container lid or bottom) into the front door of the box.

Preservice teachers assisted the first graders in making the reef in the box's interior with crumpled paper-covered cardboard that was then attached with glued-pieces of recycled copy paper. Then they helped the first graders paint the diorama box inside and out with various colors of acrylic paint. This took a couple of class visits and when a group was not painting, group members engaged in fact card or craft-making activities. See Figure 11.

Each diorama featured at least one food chain or food web on the outer side of the box. This food chain featured organisms from the diorama to reinforce the concept of an ecological community.

The back of each box included a lift-the-flap page. Generally, after the interior diorama was completed, a digital photograph of it was taken and this was printed and mounted on cardstock. This page was trimmed to fit the back of the box. Flaps were cut in this page to encompass each of the

craft organisms and bent open. Then, glue was carefully applied to the areas around the flap, but not the backs of the flaps. After the glue had dried, the first graders wrote facts about the organisms under the flaps and also labeled the organisms on the photograph.



Figure 11. Close-up of the coral reef.



Figure 12. Food webs or chains. Outer sides of dioramas showing food chains that involve organisms depicted in the diorama in the right column.



Figure 13. Lift-the-flap fact page. Back sides of dioramas showing facts about the diorama organisms.

The First Grade Classroom and Students

This section provides information concerning the classroom setting, integration of other subjects into the ocean theme, and student reactions to the project.

The Classroom Setting. The first grade class consisted of a diverse group of children of mixed abilities and backgrounds. The students were 6-8 years of age. Extended unit studies were developed for the social studies and science curriculum with reading and math integrated into the learning. The focus on integrating the arts included visual art, drama, dance/movement and music.

The classroom was decorated with several bulletin boards and objects to create excitement about the ocean theme. Figure 14 shows an "Under the Sea" bulletin board, an interactive board in which the students added drawings of things they could find under the sea and then labeled them with the name of the item. This helped develop new vocabulary related to the ocean study. Figure 15 shows another undersea themed bulletin board. Figure 16 is a photo of part of the computer area of the classroom. Technology was integrated throughout the unit. The students were able to research ocean animals as well as play computer learning games that had an ocean theme. Figure 17 shows a student-made tropical fish. Each child chose a type of sea creature to research and created a large stuffed model. These hung from the ceiling to give the effect of being under the sea.



Figure 15. Another "Under the Sea" bulletin board.



Figure 16. Computer area of the classroom.



Figure 14. "Under the Sea" bulletin board.



Figure 17. Student-made fish



Integration of Other Subjects. Throughout this unit, the main focus was on science and social studies but all of the subject areas were integrated to give the students an opportunity to read and write as well as use their math skills in many of the projects. In the science area, the students learned about the levels of the ocean and the creatures that lived in each level. They were able to explore a creature of their choice and make a large hanging model. The signature project was creating the diorama and bringing together all the information they had learned about the ocean.

In social studies, students learned the different names of the oceans and where they are located. They also learned how the oceans differed from one another and the way the ocean was part of the culture and economy of communities attached to it.

For mathematics, an integrated aspect for students was measuring while working on the diorama and oral information shared regarding the size of each ocean. The students learned about the population sizes of different species and about those that were becoming endangered. There were also ocean themed lessons related to the math skill the students were currently learning such as story problems about ocean animals.

Reading and writing were a natural partner for this unit as the students were constantly researching and finding information in the books available throughout the classroom. See part of the classroom book selection in Figure 18. Daily read-alouds were done to focus on different ocean content. The students wrote reports about their stuffed paper ocean animals and also added written content to their dioramas. Along with this was the constant integration of the arts. The students learned songs about the ocean, read readers' theater scripts with ocean themes and even learned about the tide movement of the ocean through dance and movement. As this article demonstrates, the visual arts were present throughout the entire unit. There were also several field trips that enhanced this unit. The students visited a seafood restaurant as well as a local aquarium to see fish up close.

They also viewed many different videos about the ocean. Both fiction and non-fiction books of different reading levels about the ocean were available throughout the classroom. The students used these books when researching information for their dioramas.



Figure 18. Book case.

Student Reactions to the Project. The first graders looked forward to working with the preservice teachers in small groups when they visited. Preservice teachers appreciated the opportunity to work with the first graders and to see their reactions firsthand to the lessons and craft activities they had planned. Figure 19 and Figure 20 show several scenes of first graders working with preservice teachers on their undersea dioramas. Preservice teachers coached students, encouraged them to be neat and detailed, and assisted them in developing new drawing, cutting, and writing skills.

The first graders were proud of being able to share their ocean knowledge through their dioramas which were put on display in the school library so that other students could benefit from viewing them. This partnership was a *splashing* success!



Figure 19. Photographs of first graders working on their dioramas, often showing preservice teachers assisting them.



Figure 20. Photographs of first graders working on dioramas with preservice teachers.

Reflection and Conclusion

In general, the activities went smoothly. Preservice teachers were amazed at how much the first graders enjoyed

the craft activities and how many facts they retained about the ocean organisms. This project, though complex and extending over several weeks, was valuable in motivating both preservice teachers and first graders, assisting first graders in researching information on their own or with assistance,



teaching new craft skills that built pride in accomplishment and self-expression, and demonstrating the interaction of different subject areas in the curriculum as well as the interactions of ocean communities. Many preservice teachers spent their K-12 years in school settings which had little integration of subjects or project-based learning. Professor-classroom teacher partnerships like the one reported here are essential to giving preservice teachers a new perspective on how exciting projects can really enliven learning.

Careful planning of activities and robust organization of the project allowed it to be successful. Potential problems of using acrylic paint were discussed and the painting table and floor under and around it were masked with drop cloths in case of accidental drippings. First graders can be trusted to use acrylic paints (which are generally non-toxic, but permanent when dry) if they are properly instructed in how to handle paint brushes and how to focus on their work. We did not have any real problems, but most accidents occur when a student is too aggressive in flicking or scrubbing with a paintbrush or distracted from the task. Painting aprons or old shirts were used to shield clothing.

Small group work in which there was usually close to a one-to-one ratio between preservice teachers and first graders provided a lot of guidance and attention to the learning needs of the young students. Teachers wanting to replicate all or part of this project might consider having centers in which small groups rotate through activities with one center having direct guidance from the teacher.

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