

Appendix

Preservice Elementary Teachers' Meaningful Science Learning

Core activities	Supporting examples of PsET groups learning reflections
Online discussion forum	<ul style="list-style-type: none">• “In order to be able to respond correctly to the students, we had to learn about the topic that was being presented and correctly identify the areas that needed to be improved.”• “Both the students and we learned because we had to inform ourselves to react and help them improve. We offered suggestions and the children made changes to their presentations. This means that the students were receptive to constructive criticism.”• “It was an enriching experience for all, as both sides actively participated in creating a learning community. Everyone did their part successfully and the task was accomplished, learning while teaching.”• “I was pleased to see that the students adopted our suggestions, like naming coral reefs. They were able to do the whole assignment, not leave any slides empty, and [they] added better references to the final presentation.”
Conference on Sustainable Development Goals (17 SDGs)	<ul style="list-style-type: none">• “We learned that the SDGs are aimed at all countries in general because they all have the same economic, social, and environmental problems. Before we begin the journey to meet these 17 goals, we must know where we stand to know how we should move forward. From the classroom...we must find ways to achieve these goals for a better world for all.”• “We must take advantage of these objectives and integrate them at all levels in our classroom so that in a coordinated manner all individuals in society contribute their abilities to collaborate in the welfare of the country and its citizens.”• “We learned that there is an alliance in favor of wanting to find a way to not only change the modus operandi to protect the planet, but to seek a healthy coexistence for all of us to improve as human beings. We think that this initiative gives us hope that there are people who think about a change, that there is a large community that thinks about the renewal of our ways of operating in the environments in which we develop.”• “We learned about how we can integrate the SDGs into the curriculum, promoting sustainability in different educational scenarios. It reinforced to us the importance of teaching this to our students or at least designing appropriate tools to bring it into the classroom. We got to see different plans for each of the goals and how teachers around the world integrate the SDGs as part of their curriculum. This helps us to have a broader vision of what we want to achieve with our unit.”

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1-day STEM workshop	<ul style="list-style-type: none"> • “We learned that STEM can be applied to different subjects, not just science. STEM is very engaging for the students because they learn while doing the different activities of the project that is being carried out.” • “This workshop helped us incorporate various strategies to improve teamwork in the classroom. Students should learn to get to know each other, improve communication skills, and establish division of labor when doing labs. These factors help create a positive educational environment and create a learning community. In addition, we learned how to do fun tasks that engage the students’ attention. The STEM curriculum allows students to put into practice the content that the teacher presents in the classroom at the same time they are learning. This results in much more meaningful learning for the student.” • “We learned that STEM is not an educational method; it is an interdisciplinary approach that seeks to enhance students’ capacities. The engineering design process, which is part of this approach, is an important tool for immersing students in STEM.” • “I learned that talking about STEM is talking about real life and that education based on this approach is a practice, which prepares us for the future and helps us develop skills and abilities such as creativity and innovation, critical thinking and conflict resolution, communication, and collaboration, among others.”
1-day field trip to ecosystems in northeastern Puerto Rico	<ul style="list-style-type: none"> • “As for what was discussed on the trip, my most meaningful learning was that we need to appreciate our nature more often and that we are surrounded by great natural architectures and we have the right and obligation to take care of everything from animals, insects, fruits, trees, rivers, mangroves, beaches, etc.” • “One of the most meaningful lessons I learned during the field trip was the great ecological value of the Espíritu Santo River. In addition, I learned about the great importance of taking students on these types of field trips. Students get to create connections with the outdoors, and in this way meaningful learning is achieved.” • “The most meaningful learning was to become more involved with the students and give them my trust to help them with their work. And it helped me to understand more about the characteristics of this ecosystem. I learned new things, like the names of the types of birds that live there.” • "I learned or confirmed once again that field trips are necessary for students to learn...and have real experiences with what they are studying. Talking to students about a river, an estuary, El Yunque, the trees, a tropical forest...is not the same as being in these places to experience them first-hand.”

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2-day educational residential trip to ecosystems in southwestern Puerto Rico	<ul style="list-style-type: none"> <li>• “First, we visited Las Salinas in Cabo Rojo, where we learned about the process of making salt, species that live in the nearby water as monkey fish, invasive plants, products that come from the salt flats, and the usefulness of it. In addition, we learned about the process that is carried out to obtain the salt. On the other hand, from this residential [trip], we can learn that it is possible to carry out innovative educational activities with our students, which makes learning more effective compared to the traditional [lessons] in schools.” <li>• “We had the great opportunity to participate in the Municipal Assembly of the municipality of Cabo Rojo, and the students had the opportunity to observe how decisions are made in the legislature. ...Cabo Rojo is a municipality full of culture, diversity of species, and history. Also...I realized how much organization it takes to coordinate a field trip, but it is worth it to see how the students enjoy while they learn.” <li>• “Visiting the town hall and witnessing the regular session was one of the experiences I enjoyed the most, both we (future teachers) and the students were excited to be there and see this process live. Finally, Friday’s learning centers allowed me to understand that as teachers we must be attentive to the students’ behaviors to know when it is appropriate to make or not to make changes to the established plans.” <li>• “This activity was full of enriching experiences. One of the most meaningful learnings I experienced was the value of having or developing a healthy and friendly relationship with your students. It was very valuable to observe the students at different learning centers, having fun while learning. As students as well as future teachers, we took away an experience for life, which we can later share with others.”