Terevaka Archaeological Outreach (TAO) 2023–2024 Field Report: Making Public Archaeology Less about Archaeology and More about Community Engagement

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Introduction

As a US-based 501(c)(3) non-profit organization, Terevaka Archaeological Outreach (TAO) provides experiential education to teenage students on Rapa Nui (Easter Island, Chile) as well as in other locations across South America. Since 2003, TAO has hosted 18 programs on Rapa Nui, two programs in the Sacred Valley of Perú, and two programs in Patagonia National Park (Chile). Preparations are underway for the first program implementation in San Pedro de Atacama (Chile) in October of 2024. AQ1

In partnership with Explora hotels (www.explora.com), the program typically offers an intensive, two-week educational campout on a yearly basis at each destination. Explora provides critical support in terms of meals, transportation, facilities, and classroom space. Explora guides also contribute by leading TAO students on

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hiking explorations to learn more about nearby attractions. One of the keys to the program's success is the fact that the curriculum and projects are developed specifically for each individual community and region (Shepardson 2021; Shepardson et al. 2023).

TAO began as an archaeologically focused initiative, and public archaeology programs continue to gain traction, particularly in the US. The Society for American Archaeology (SAA) claims, "Many archaeologists encourage the public to be directly involved in archaeological projects. After all, it is their community and their heritage being studied!"

At the same time, the broadening scope of TAO projects demonstrates how the SAA may be underselling the vast potential of archaeology as an educational tool within public outreach initiatives. This concern is underscored by the reality that only an estimated 8700 jobs out of a total of approximately 161,183,000 in the US are devoted to anthropology or archaeology (US Bureau of Labor Statistics). Less than 1/100 of 1% of jobs in one of the world's most developed economies focus on archaeology. Acknowledging the unlikelihood that TAO students eventually find gainful employment in the world of archaeology is an important step in designing the student-oriented experience.

TAO programing has expanded to focus on rural and indigenous high school students, developing foundations for a wide variety of career choices. TAO curriculum strives to help students gain a glimpse of the power of combining traditional cultural knowledge with modern technology in search of solutions for regionally based sustainable development. When possible, archaeological remains and archaeological research provide a critical context for students to explore modern dilemmas. However, TAO projects tend to take advantage of the multi-disciplinarity of archaeology more than the research of the past in and of itself.

TAO's commitment to centering community concerns rather than archaeological concerns stems from three fundamental goals:

(1) *Education*. TAO students learn to love and love to learn. By exploring their surroundings with seasoned guides and professionals, students gain firsthand experience in the personal fulfillment of enjoying natural and cultural resources responsibly. TAO curriculum, regardless of subject area or regional implementation, foregrounds the educational experience for students rather than the immediate gains in cumulative knowledge or conservation. The multidisciplinary design ensures that all students find intellectual intrigue in some aspects of the work.

(2) *Conservation*. Through projects that include a conservation component and a shared living space, TAO students learn to respect their material surroundings as well as their peers. Their experiences also help instill a sense of responsibility for the relationships they build with each other, as well as for the landscape.

(3) *Research*. Our hands-on approach to research provides an immersive and invaluable foundation for students in systematic inquiry, field/laboratory technology, and computation as they explore options for future studies or careers. An intensive two-week experience creates the perfect foundation for students who seek a deeper understanding of their surroundings in the future, while also demonstrating the accessibility of different avenues of investigation.

In the last ten months, TAO successfully reached 64 students, completing four programs: one in the Sacred Valley, one in Patagonia National Park, and two on Rapa Nui.

Sacred Valley and Patagonia National Park

TAO focused on three projects in the Sacred Valley of Perú:

(1) Our water contamination project provides a systematic assessment of properties and contaminants along the Urquillos River using SJ Wave 16-in-1 colorimetric Water Test Kits. In total, the students collected and analyzed 54 water samples from 17 different locations along the river. Spatial and temporal monitoring of the Urquillos River is particularly important for the Urquillos community, not only to determine household and agricultural contributions to local contamination but also because a new international airport in the Chinchero highlands above Urquillos might be operational by 2027 (Figure 1). Industrialization and increased traffic near Chinchero could easily have detrimental effects on the primary water source upslope from Urquillos crops.The TAO water contamination project was designed to raise awareness among local students of impending development and to provide experience in systematic sample collection, GPS mapping, digital photography, laboratory analysis, and data entry using computers. Even within a two-week span, TAO students were able to discern potential patterns in the data. Certain characteristics of the Urquillos River water seemed to remain relatively constant (*e.g.*, pH, carbonate levels) regardless of the sampling locations upstream or downstream. On the other hand, students found measurements suggestive of an upward trend in water hardness and quaternary ammonium compounds as sample locations proceeded downstream and through the town. The information collected by students was added to an interactive web database to raise awareness within the Urquillos and nearby communities (https://terevaka.net/projx/vas/agua). In future iterations, TAO students will repeat testing and expand our database geographically within the Sacred Valley to complement the various explorations students completed with Explora guides (Figure 2).

(2) TAO students also participated in the second year of an ongoing archaeological conservation project on the Explora hotel property, documenting archaeological terrace walls through three-dimensional orthocorrective photogrammetry. Using a Canon EOS-6D DSLR body and Canon EF 24-105mm f/4L IS USM lens, the students created high-resolution imagery of Inca stonework (Figure 3, https://sketchfab.com/terevaka). Agisoft Metashape software was used to stitch photographs together and extrapolate topographic information. While Explora has taken appropriate steps to protect these archaeological remains, detailed stone-by-stone photomosaics and 3D renderings provide digital backups in case the terrace walls suffer any additional damage or collapse. In the archaeological conservation project, students learned about Inca and pre-Inca agricultural terracing in the region, photogrammetry, mapping, and photogrammetric software.

Figure 1. TAO students sampled the Urquillos River, a tributary of the larger Urubamba River, in hopes of documenting water conditions prior to the opening of the Chinchero international airport on the mountain plains that divide the lower Cusco Valley from the Sacred Valley.

(3) TAO students also launched a pilot project to identify flowering plants in the Sacred Valley (Figure 4). Their work set the foundation for an interactive web database regarding scientific names, nutritional/medicinal information, and Quechua names or oral traditions relating to the flora when possible. The students learned aspects of GPS mapping, internet research, digital photography, species identification, and data management using spreadsheets.

In Patagonia National Park, TAO also focused on three projects:

(1) Students continued to add data to a growing internet database of flora found in the region (Figure 5, https://terevaka.net/projx/pnp/flora). As in the pilot project for flora in the Sacred Valley, students used digital cameras, GPS units, and spreadsheets to record information about each species. However, in Patagonia, students also learned to use a plant press to collect, dry, press, and laminate individual samples for future reference. Additional internet research allowed students to learn about the maximum growth size, elevation ranges, and geographic origins of each species as well.
(2) Students also continued to collect longitudinal data regarding lichens growing at different distances from the urban center of Cochrane. By collecting data regarding the location, size, and colors of lichens, TAO students help to

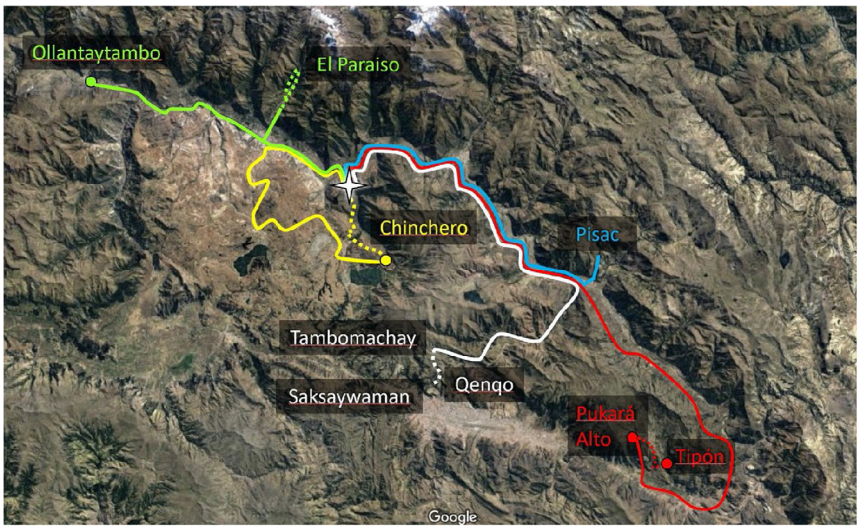

Figure 2. TAO students completed five full-day tours during the program, originating from Explora Sacred Valley, to visit archaeological remains and conservation areas throughout the region.

establish the framework for a database that could help identify the impacts of global climate change in the near and distant future (Shepardson et al. 2023).

(3) TAO students launched a new pollution project to analyze litter along the tributary of the Cochrane River that runs through the town. After learning about the damage that littering can cause, not only as an eyesore but also adding toxic chemicals to an otherwise remarkably clean waterway (and eventually our lakes and oceans). TAO instructors designed a data collection system that allowed students to use their own cell phones to record geographically referenced information regarding more than 1500 individual pieces of litter along a six-block stretch of the Cochrane River tributary. Their collective work was used to create a web-based heatmap displaying the most intense areas of contamination along the waterway (Figure 6, https://terevaka.net/projx/pnp/heatmap). Within the two-week implementation of TAO, students were also challenged to identify potential correlations between litter hotspots and town infrastructure (*e.g.*, bridges, paths, picnic benches) and to brainstorm improvements in town planning to help remedy the local littering problem.

Rapa Nui

In November of 2023 and August of 2024, two TAO-Rapa Nui programs bookended the Sacred Valley and Patagonia implementations. With more than 20 years of experience, the TAO curriculum has been carefully refined to strike a balance between field research and computer/laboratory work, as well as between cultural conservation and sustainable development. In sum, students hiked nearly 30 miles (48 km) in the two-week program. With the additional vehicular support provided by Explora, students were able to visit dozens of archaeological sites accompanied by archaeologists

Figure 3. TAO students photographed the Inca terraces systematically from a variety of different perspectives to create orthomosaics.

and expert local guides (Figure 7). Each visit allowed students to record important information about site context, conservation efforts past and present, and oral traditions shared throughout the group.

When TAO students weren't hiking or visiting archaeological sites, they continued work as key collaborators on a National Science Foundation project that pilots new non-invasive ultrasonic scanning technology to assess the deterioration and stability of the interior tuff of dozens of *moai* (megalithic statues). In fact, the data collection by TAO students has allowed our international team of collaborators to determine that future fieldwork for the project would likely be more successfully executed using the Pundit PL-200 rather than the Pundit PD8050 ultrasonic scanning device that was used in 2023.

On a broader scale, the ongoing non-invasive scanning project encourages students to learn more about the rise and fall of Rapa Nui's statue industry. Students learn how differential weathering between the statues' original surfaces and exposed broken surfaces could help archaeologists determine approximations for the construction and/or destruction of statues. From a conservation perspective, the project also teaches

Figure 4. Photographs taken by TAO students were used to launch our digital database of flowering plants of the Sacred Valley region.

Figure 5. Data collected by TAO students was used to create a heatmap of litter intensity along the tributary of the Cochrane River that passes through the town of Cochrane.

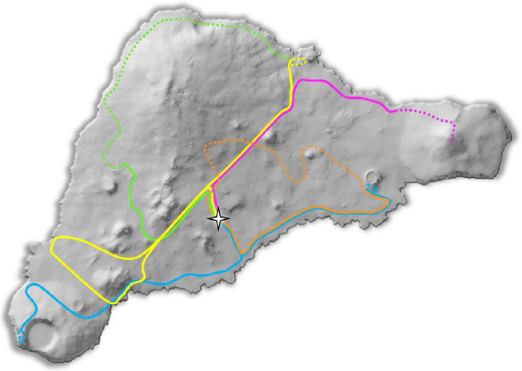

Figure 6. Students explored (solid lines indicate van routes; dashed lines indicate hiking routes) dozens of archaeological sites across the island during the TAO-Rapa Nui program.

Figure 7. Principal investigator Dr. Mark McCoy (lower left) of Florida State University leads TAO students through 3D and ultrasonic scanning of statues in Rapa Nui National Park while officials from Ma'u Henua Indigenous Park Administration supervise.

students about the pitfalls of statue restoration techniques used in the 1960s–1990s (*i.e.*, metal rods and cement to reattach statue heads to bodies). In the field, TAO students learn about remote geophysical sensing techniques, 3D scanning, digital photography, and GPS mapping (Figure 8).

In the 2024 version of TAO-Rapa Nui, students also launched a project to explore Polynesian kite-flying traditions. Classroom sessions and online research motivated students to dive into the ancient world of recreation, myths, songs, religion, warfare,

Figure 8. TAO students created and tested their own designs in the experimental kite-flying project on Rapa Nui.

and fishing that stem from centuries of kite flying on Pacific islands (Emerson 1921; Buck 1927; Chadwick 1931; Baldwin 1977; Sailors 2011). While more is known about the historical tradition of kites elsewhere, Métraux (1940:353) left us only two sentences regarding the tradition on Rapa Nui: "Kites, called *manu hakarere* (flying birds), were made of tapa cloth and the head of a bird was painted on each of them. They were flown by children." In their archival research, TAO students also found a chant that would accompany kite-flying in Rapa Nui:

E hakarere ta manu é,
Nae tu Here-veri é;
E Uka-ui é, ka kau te umu ena
E tu Here-veri é
Ka haro-haro mau,
O matua ere é
E Pore-iti, e Pore-nui,
Tau tama iti here é.

Following step-by-step instructions to assemble their first kites and then using what they had learned to create their own designs, students learned about lift, weight, thrust, and drag—some basic principles of flight. They used hand-held anemometers to record information about wind speed and direction on the island, and they used a digital rangefinder to measure the distances that their kites extended from their launching point (student-designed kites reached a maximum of 935ft or 285m!). Classroom sessions introduced students to various entrepreneurial endeavors around the world to

use kites (or subaquatic analogs) to harness renewable energy from high-altitude winds or underwater currents (Loyd 1980; Vance 2009; Cherubini et al. 2015; Harris 2019; Jonkman 2021; Vermillion et al. 2021; Fagiano et al. 2022; Schmidt et al. 2024). Students then had the opportunity to test the force that their various kite designs could generate by anchoring their kite lines to digital luggage scales.

Conclusion

Every implementation of TAO provides a learning experience not only for indigenous and rural students but also for the leadership of the TAO program. As the program continues to expand, more communities participate, and more challenges in sustainable development come into focus. In so many cases, economic development in these remote areas depends on tourism. Tourism thrives on archaeology; archaeological research becomes closely linked to local conservation initiatives, and cultural conservation intertwines with the environment. While the whole world gains access to these remarkable destinations, stewardship responsibilities for the environment (and cultural heritage) rest squarely on the shoulders of local residents.

Without programs that sensitize today's youth to the intimate connections between business, culture, and environmental change, tomorrow's leadership will be unsurprisingly detached from key issues in conservation and research. Archaeology is an important field of study in its own right, but it might have even more untapped potential if we focus on the multidisciplinary nature of archaeology rather than specific investigative topics in generating educational experiences for the public that help people understand the trajectory of human-environment interactions over the course of centuries or even millennia. Furthermore, particularly for Indigenous students, contextualizing a topic like renewable wind energy in the cultural tradition of kite-flying might help students see the genius of their forebearers, the relevance of ancient culture in the modern world, and the right (or even advantage) that these students have in accessing careers related to emerging problems in an evolving social and political landscape.

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