

Decolonizing the Classroom and Centering the Biocultural Heritage of Cenotes in Yucatán, Mexico

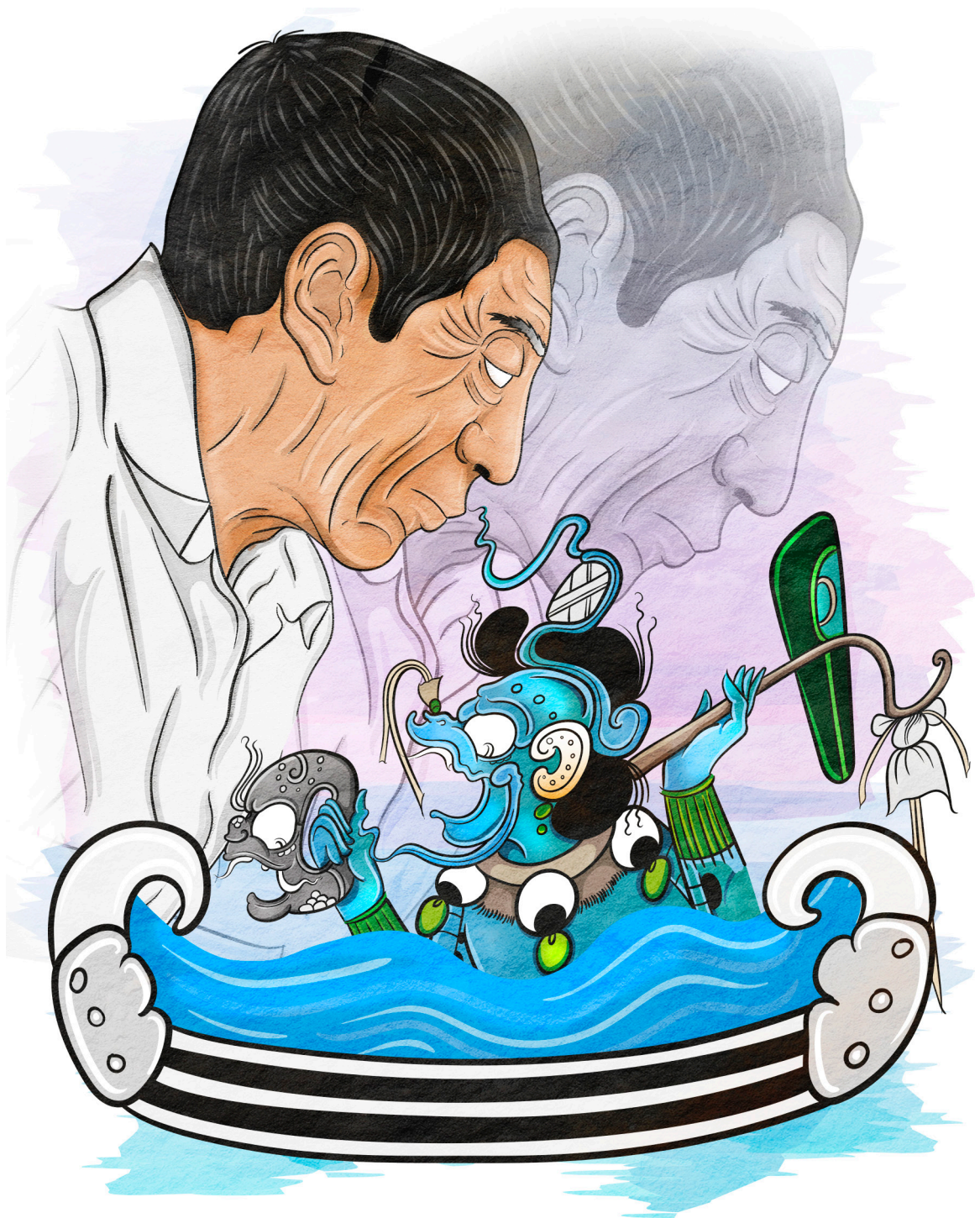
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Conservation of the biocultural heritage of Yucatec Maya cenotes (i.e., limestone solution sinkholes) is endangered by contamination, tourism, and neglect. A recent project entitled the Cultural Heritage, Ecology, and Conservation of Yucatec Cenotes sought to address the many threats to cenote conservation through an interactive educational program with middle-school students in nine small communities located on the eastern side of the state of Yucatán. Participant communities included Yalcobá, Ticuch, Cuncumul, Kaua, Xocén, Calotmul, Tixhualactún, Tahcabo, and Hunukú. Workshops with teachers and a pilot program with students emphasized the collaborative nature of learning and sought to introduce more experiential and active learning into and outside the classroom. Inspired by anthropologist Sonya Atalay's Anishinaabe concept of "Braiding Knowledge," wherein diverse Indigenous and non-Indigenous knowledge systems are incorporated and intertwined, the project was designed to integrate community knowledge about cenotes, highlight the perceptions of Maya youth, and support learning objectives desired by their teachers. In this article, results of surveys administered to students and teachers before and after the pilot project are presented and discussed. Significantly, survey responses articulate subjective, multivocal, and holistic understandings of place, mythic histories of cenotes, and potentialities of Indigenous futures.

Keywords: Yucatec Maya; Decolonizing the Classroom; Biocultural Heritage; Survey Assessment; Indigenous Futures



Thousands of cenotes dot the northern Yucatán Peninsula. These natural, water-bearing openings into the earth's karst surface come in various forms (Figure 1). Cenotes in Yucatán are connected via a subterranean freshwater aquifer system and they, along with the aquifer, are the only continual source of natural freshwater in the area except for seasonal rainfall (Beddows et al. 2007:33; López-Maldonado and Berkes 2017:10). Cenotes have long been highly valued landscape features to Maya communities in Yucatán (Figure 2). Archaeological investigations in and near cenotes, including the infamous dredging of the Sacred Cenote at the ancestral Maya city of Chichén Itzá by Edward Thompson (1904-1910), have demonstrated that cenotes indeed were places of offering. At the Sacred Cenote, jade beads and pendants, fine obsidian objects, pottery, gold masks featuring the rain god Cháak, and even human remains were among the offerings (Coggins 1984, 1992).



Despite their great importance to Maya biocultural heritage, cenotes in Maya communities are increasingly endangered by pollution and contamination. In this paper, we use the term *biocultural heritage* to 1) define spaces of environmental and social diversity; 2) envision the material expression of memory and its relationship with the cultural transformations of indigenous peoples; 3) and provide a central argument to encourage social participation in the preservation of heritage by promoting a scheme of co-responsibility (Boege 2008; Toledo and Barrera-Basolls 2008; and Cárdenas García 2016). Understanding the heritage of cenotes in this manner allows us to envision conservation of landscape as one that is about the interconnectivity of people and place, rather than considering environment as apart from human culture and distant from human memory. The following is a discussion of the biocultural importance of cenotes to Maya communities of Yucatán.

Maya Communities of Yucatán

Between June 2018 and December 2019, middle school students in Yucatán took part in a collaborative project supported by the National Geographic Society. Entitled *The Cultural Heritage, Ecology, and Conservation of Yucatec Cenotes*, the project was geared toward the conservation and ecology of these precious places and included the communities of Yalcobá, Ticuch, Cuncunul, Kaa, Xocén, Calotmul, Tixhualactún, Tahcabo, and Hunukú (Figure 4). The project also explicitly focused on the archaeology, oral and mythic histories, and overall biocultural patrimony of cenotes. The creation of a sustainable educational initiative was a long-term goal to be realized in the production of a teacher's guide (Batún Alpuche et al. 2021). The teacher's guide and the overall project were a collaborative effort led by a University of North Carolina-Chapel Hill program called *InHerit: Indigenous Heritage Passed to Present*, Universidad de Oriente (UNO) in Yucatán, and nine middle schools in Maya communities in eastern Yucatán.

The project aimed to involve Indigenous communities, and in particular Maya youth, as active collaborators in the development and implementation of project goals. Since the project would be based in classrooms, the design emphasized experiential learning and empowering students

as researchers to collect oral histories of cenotes within their communities as well as perform scientific tests on the quality of cenote water. These goals align with recent reforms to teaching standards within Mexico in which more attention to experiential education and local histories is recommended. Such efforts to decolonize the classroom (Furo 2018; Parker et al. 2017) move away from a top-down approach to education in which students are seen as empty vessels to be filled. As Tuck and Yang (2012) remind us, decolonization is not a metaphor. Rather, it is a sustained effort to reckon with the chaos and violence of European colonialism and to work towards a rebalancing of power in which the rights, authority, and knowledge of Indigenous peoples—particularly in respect to land and landscapes—are respected. By focusing on cenotes and highlighting local knowledge in collaboration with Maya students and their teachers, this initiative has worked in a decolonizing mode. Details follow in the sections below.

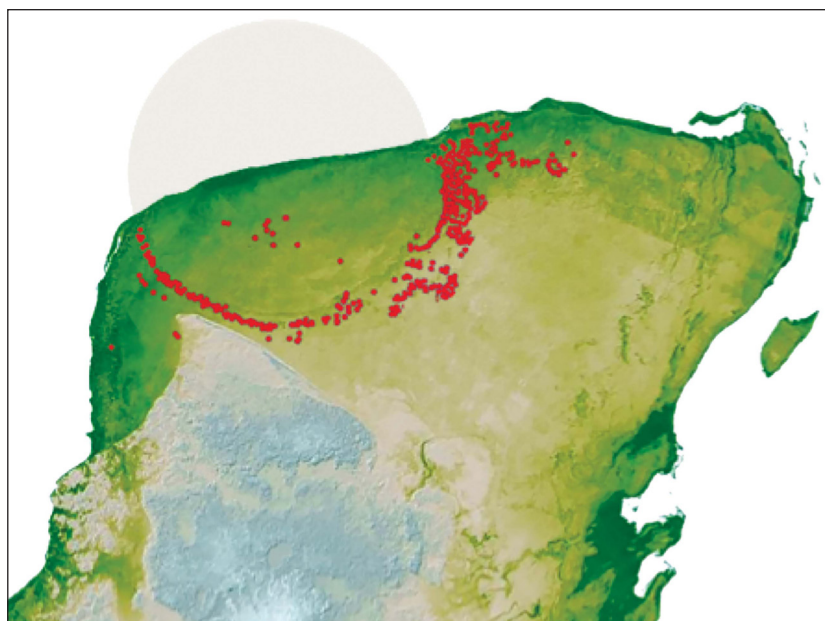


Figure 1. Map of the Yucatán Peninsula depicting cenote ring. Colored Shuttle Radar Topography Mission (STRM) elevation model from NASA (2000). Overlain are the sinkholes considered as part of the “Ring of Cenotes” (SEDUMA, 2017).

Phases of Project Implementation

The project was designed in five phases, which are briefly described here (see Landry Montes et al. 2020 for more details). Each phase was created through collaboration with InHerit project staff including Principal Investigator Patricia A. McAnany, Co-directors Adolfo Iván Batún Alpuche and Dylan Clark, Project Facilitator Khristin Landry-Montes, two UNC Global Investigator undergraduates, nine Student Ambassadors from the Universidad de Oriente (UNO), teachers and students from the nine Yucatán community middle schools, and additional content area specialists from both Mexico and the U.S. The project phases are individually outlined below:

Phase 1. Pre-project assessment using a question-based survey and a methodology called “Photovoice” (see Clark et al., this volume) to establish and understand students’ existing knowledge of community cenotes;

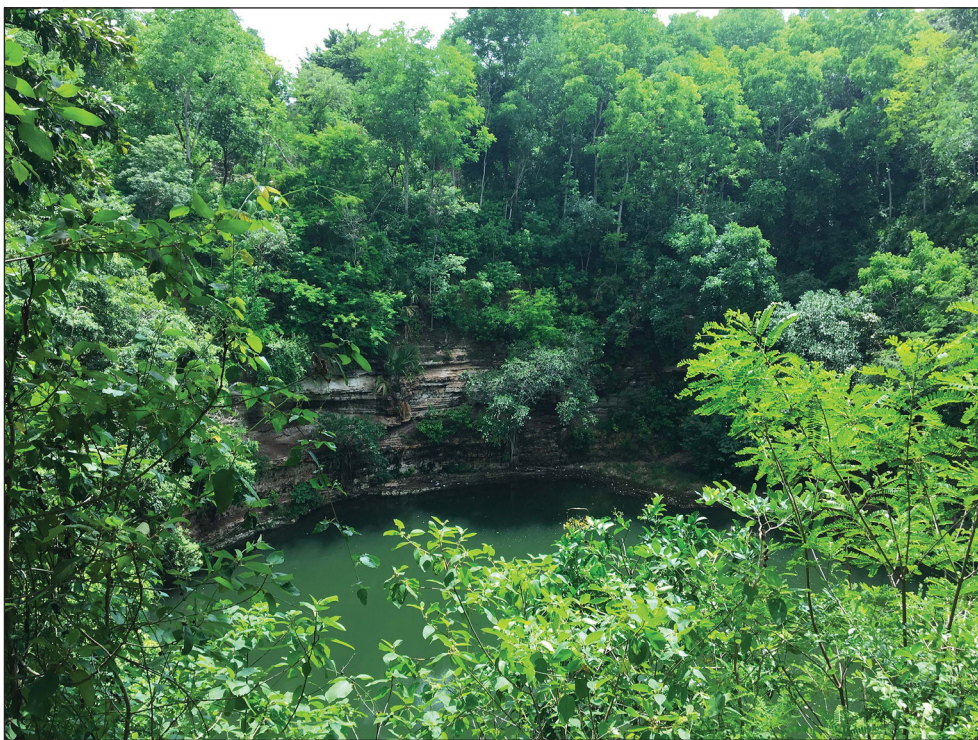


Figure 2. Cenote Yaax Ek, Kaua, Yucatán. Photo by staff of Cultural Heritage, Ecology, and Conservation of Yucatec Cenotes Project (CHECYC), 2018.

Phase 2. Workshops in which teachers, project members, and subject experts gathered to discuss cenote-focused themes and create activities to be used in the classroom;

Phase 3. Implementation in which thematically planned activities were undertaken in the classroom and on short field trips to local cenotes;

Phase 4. Post-project assessment involving additional surveys to evaluate student learning and what students wished to know more about, and what teachers had gained from the pilot curriculum; and finally,

Phase 5. Planning and writing a curriculum-oriented workbook for teachers. The workbook contains background information, teaching modules, and activity ideas related to a cenotes-focused curriculum.

Each project phase was grounded in community-based participatory research methods (CBPR) as part of our decolonizing practice. According to Sonya Atalay (2012:3), “a central tenet of CBPR is to value information and ways of knowing contributed from diverse knowledge systems.” CBPR also requires that “scholars and community members develop equitable partnerships [...] that are community driven and address the concerns that matter to members of descendant and local groups” (Atalay 2012:3). One of our most dynamic experiences with CBPR was in the form of assessment tools (Phase 1 and 4), including both surveys and Photovoice. The surveys—provided to students before and after the project and to teachers after the workshop phase (Phase 2) and

at the conclusion of the pilot implementation phase (Phase 3)—form the basis of this paper. The student surveys provide a window onto student perceptions and insight on the community knowledge they brought to the table, as well as what they took away from the experience. Teacher surveys are more sobering and indicate challenging areas of growth to be addressed so that teachers will be more informed about the deep biocultural heritage of Yucatec cenotes.

Listening to Students and Teachers

Surveys were created by an advisory board consisting of Yucatec middle school teachers and school directors, the project's principal investigator, project directors, project facilitator, UNC global investigators, and UNO student ambassadors. The preliminary questionnaire for students was developed to gauge their initial experience with cenotes in their communities before the project began its workshop and implementation phases. Preliminary surveys given to teachers, on the other hand, were completed only after teachers had a chance to engage with the workshops. Teacher surveys attempted to assess which of the workshop curricular foci and learning activities might be most beneficial to teachers in their classrooms. Following the implementation phase, both students and teachers were simultaneously given post-project surveys. For students, post-project surveys reflected what they had learned from the project, what they wanted to see continued, and to what degree they felt empowered to care for cenotes. For teachers, post-project surveys served primarily as a vehicle for understanding if and how they would implement cenote-related activities into

their classrooms. Post-project surveys were especially important in reflecting the degree to which cenote-focused curriculum could be sustainable. Both the survey and results from the second assessment tool, Photovoice (see Clark et al., this volume), were used to shape workshops, classroom activities, and the overall approach of the project.

Student response to the preliminary assessment tools allowed the advisory board to develop

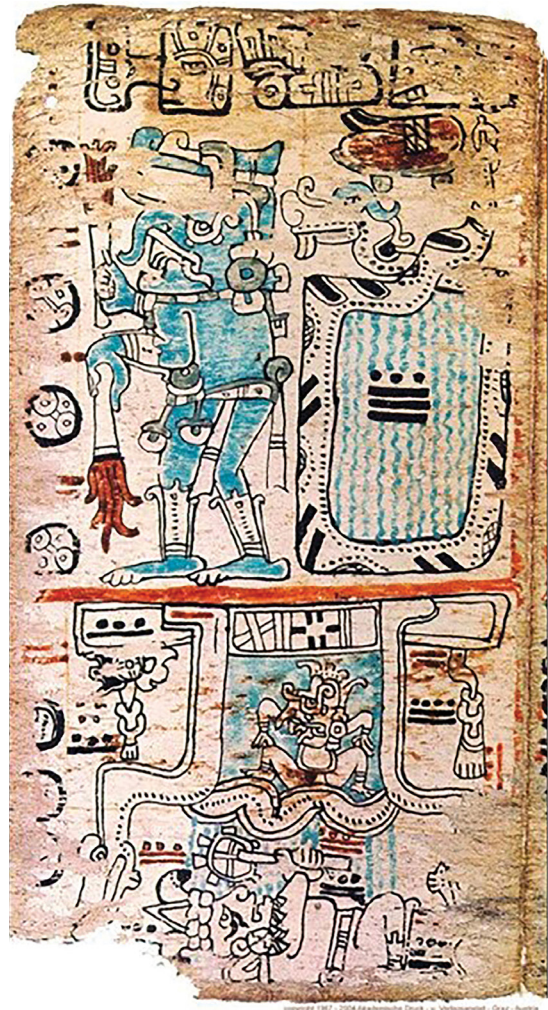


Figure 3. Almanac: 3a-6a Frame: 3 of the Madrid Codex depicting, in the top register, the rain god Chaák in front of what is likely a stylized cenote bounded by a snake. Original drawing by Villacorta C. and Villacorta (1976:234). Vail, Gabrielle, and Christine Hernández. 2018. The Maya Codices Database, Version 5.0. <http://mayacodices.org/frameDetail.asp?almNum=4&frameNum=3>

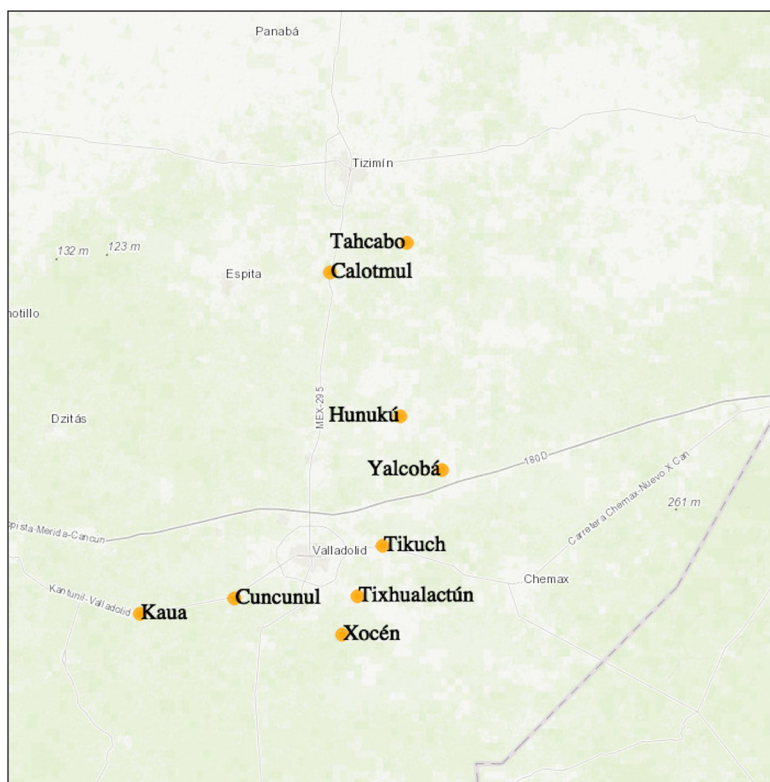


Figure 4. Map depicting the northern portion of the Yucatán Peninsula and the nine Maya communities involved in the CHECYC.
Image by David Rigby.

workshops and curricula that further clarified thematic areas in which students had expressed interest. These areas included *Oral History and Folklore*, *Science and Safety*, and *Archaeology and Biocultural Heritage*. Classroom activities were generated based upon these themes. For example, as part of *Oral History and Folklore*, the team introduced oral history backpacks that contained materials to support Yucatek Maya language learning. The backpacks were equipped to sustain storytelling as an art form with the goal of connecting traditional knowledge and language to conservation ethics, and youth to community elders. Physically, the backpacks included notebooks

and pens, voice recorders, and flashcards providing cenotes-focused vocabulary terms as well as flashcards with ideas for interview questions. Flashcards were written in both Yucatek Maya as well as Spanish. The workshop theme *Science and Safety* primarily involved discussions surrounding the geomorphology of cenotes, their function as a source of water, and their conservation. Activities generated from this workshop theme (which proved to be quite popular) included field trips to local cenotes where water quality testing and driving an underwater drone would be conducted. The last workshop theme, *Archaeology and Biocultural Heritage*, involved activities such as identifying the presence and function of cenotes in Maya codices—books of religion, ritual, and prophecy created by the ancestral Maya prior to European incursions (Figure 3). Specific workshop activities were complemented with a more general overview of codices as priceless and primary Indigenous sources reflecting conceptions of sacred landscape and cyclical time (Hernandez and Vail 2013). Workshop themes fed directly into the implementation of associated experiential education and activities in the classroom.

In hindsight, the preliminary student surveys proved vital to the development of both the workshops and the classroom activities. In a sense, students undertook activities that they themselves

had asked for and helped develop through their survey responses. Utilizing this interactive approach, both students and teachers helped shape the subsequent implementation phase. To better familiarize the reader with the overall content of the surveys and how they impacted the development of the project, preliminary and post-project survey questions are listed in Tables 1-4.

Survey Questions

Student Surveys. Students were provided with both preliminary and post-project surveys in their classrooms by the Project Facilitator and co-directors. Preliminary surveys (Table 1) contained ten multiple-choice questions and one short-answer prompt. All surveys were administered in Spanish; though English translations are provided here. Preliminary surveys were geared toward assessing what the students knew of the cenote/s in their own towns and how they knew this (4). Post-project surveys (Table 2) assessed what students had learned by taking part in the project and what they felt was most valuable. These surveys consisted of 10 short-answer questions. Teachers also undertook surveys at both the start and conclusion of the project. Preliminary surveys for teachers (Table 3) included 10 short-answer questions. Post-project surveys for teachers (Table 4) included 12 short-answer questions. Preliminary surveys were designed to gauge how teachers became involved in the project and what they initially felt was most important in terms of the relationship between cenote heritage and conservation and their students' education. Post-project surveys assessed what teachers felt was most valuable to future teaching and cenote-focused curriculum sustainability.



Responses of Students and Teachers

Project Facilitator Kristin Landry-Montes and a team of students from Cornell College (Maryellen Hinken, Armani Rogers, Ariana Ramirez, and Fredy Portillo) coded and analyzed the survey answers in the fall of 2020. Using Excel spreadsheets and Google forms, they systematically recorded the information and produced charts and graphs depicting trends in the answers (Figure 6). Survey results were shared and discussed with the project's Principal Investigator, Patricia A. McAnany and co-directors Drs. Adolfo Iván Batún Alpuche and Dylan Clark.

Responses of both students and teachers captured a number of important points. Post-project surveys given to students, for example, showed an overall preference among students for particular activities. The most popular was testing the quality of water in cenotes as part of the *Science and Safety* theme, employing testing kits donated by EarthEcho. Post-project surveys also showed that students were highly interested in learning about the representation of cenotes in ancestral Maya codices, which was taught as part of the *Archaeology and Biocultural Heritage* theme. Prior to this initiative, few students knew of the codices and the deep intellectual heritage of Maya book-making. In the classroom, students learned about the history of the codices and the importance of cenotes

Question	Answer Option	Answer Option	Answer Option	Answer Option
1. Do you live near a cenote, a cave, or a <i>rejollada</i> (dry sinkholes)?	Yes; Close to which one [which cenote]?	No	Not Sure	
2. Have you visited a cenote in your community?	Yes	No	Not Sure	
3. Do you know about cenotes and how they are formed?	Yes	No	Not Sure	
4. Do you know why cenotes were important to your Maya ancestors before the arrival of the Spaniards?	Yes	No	Not Sure	
5. Do you think you can help protect the cenotes in your community?	Yes	No	Not Sure	
6. Do you think cenotes are only important for tourism?	<i>Very much in agreement</i>	<i>In agreement</i>	<i>Not in agreement</i>	<i>Not sure</i>
7. Do you think the cenotes in your town are clean and free of pollution?	<i>Very much in agreement</i>	<i>In agreement</i>	<i>Not in agreement</i>	<i>Not sure</i>
8. Do you agree that the people in your town see cenotes as important?	<i>Very much in agreement</i>	<i>In agreement</i>	<i>Not in agreement</i>	<i>Not sure</i>
9. Do you think that people in your town think that cenotes are dangerous?	<i>Very much in agreement</i>	<i>In agreement</i>	<i>Not in agreement</i>	<i>Not sure</i>
10. Do you think more people should know more about cenotes and know how to protect them?	<i>Very much in agreement</i>	<i>In agreement</i>	<i>Not in agreement</i>	<i>Not sure</i>
11. Short answer/drawing. In the space below or on the back of this sheet, write in your own words, tell a story, write a poem, or draw a picture of what cenotes mean to you. (See Figure 5 for an example of a student response to this prompt.)				

Table 1. Preliminary student surveys.

Question	Answer Option
1. Which learning activity about cenotes did you like the most? Why?	Open-ended
2. What have you learned about how cenotes and rejolladas were formed that you did not know before?	Open-ended
3. Is it important to test water quality in cenotes? What can we learn?	Open-ended
4. What have you learned about how the ancient Maya used or thought about cenotes before the arrival of Spaniards in the 16 th century? And, how do we know?	Open-ended
5. What is the most interesting or fun fact that you have learned about cenotes from your studies this year?	Open-ended
6. What kinds of stories do elders in the community tell about cenotes?	Open-ended
7. How and why do people visit and use cenotes today? Is this similar or different than in the past?	Open-ended
8. Are there any aspects of cenotes that you wish to study or investigate more?	Open-ended
9. Do you believe cenotes should be protected? Why?	Open-ended
10. What are two ways in which we can all protect the cenotes in or near our communities?	Open-ended

Table 2. Post-project student surveys.

as elements of sacred landscapes, which are depicted within the folios of the Maya Madrid and Dresden codices. Students analyzed facsimiles of the codices to identify cenotes and related water deities (Figure 7). After this classroom activity, students created their own codices depicting their town's cenote and a patron deity from ancestral Maya times (Figure 8).

Beyond clarifying student preferences for activities, answers on both preliminary and post-project student surveys provided opportunities for students to relate oral histories that had been transmitted between generations in their towns. Some stories were specific to a town and were frequently recounted. For example, students from Xocén collected oral histories related to the Caste War of Yucatán (1847-1901), a Maya-led insurgency against the land-owning population of primarily European descent (Farriss 1984; Restall 1997; Rugeley 2001). Students related learning from elders that, during this time, dry chambers of cenotes were used as hiding places for insurgents and also to store weapons.

Other oral histories collected by students presented Maya cosmology and the mytho-historical accounts of how local cenotes formed. In the town of Kaua, for instance, students told of a meteorite

Question	Answer Option
1. How did you first become aware of the Cultural Heritage, Ecology, and Conservation of Yucatec Cenotes project?	Open-ended
2. Did you attend any of the workshops for this project at UNO? If so, which workshop(s) did you attend?	Open-ended
3. Did you attend any advisory board meetings for this project?	Open-ended
4. Before this project, did you teach about cenotes in your classes? Within what subjects or curricular themes is the topic of cenotes usually taught?	Open-ended
5. What do you think are the most urgent environmental issues facing your students and Yucatán today?	Open-ended
6. How do you think we can best harness the energy of 11-14 year-old students towards conservation and ecology?	Open-ended
7. What do you think most motivates your students?	Open-ended
8. Which of the workshop themes are you incorporating into your classes this year?	Open-ended
9. What connections do you see between different subjects and cenotes that you are already teaching? Is it possible to connect them? How will you do it?	Open-ended
10. What do you believe is the most important role that cenotes play in your students' lives and communities today?	Open-ended

Table 3. Preliminary teacher surveys.

that fell to the earth and created a giant, water-filled hole. Following this event, a green star also crashed in the same place and turned the cenote green. Today, it is called Yaax Ek (Green Star), reflecting a story handed down through generations. One student from Kaua recounts the event as follows:

“To me, the cenotes signify something important. We consider them part of our heritage. One of the stories in our town is about a local cenote. People say that there was a meteorite that fell here in Kaua. It made a deep hole and was filled in with water quickly. Then, a star also fell from the sky and turned the water green. That is how the cenote here was formed. For us, cenotes are a part of our heritage because our ancestors left them and we consider them a treasure. We appreciate them a lot.” (translated from Spanish by Maryellen Hinken)

Examples of oral histories shared between towns also appeared in both preliminary and post-project surveys. A recurring theme is that of cenotes being used by the ancestral Maya to sacrifice female virgins. Although not widely documented archaeologically, the story comes from legends of human sacrifice surrounding the Great Cenote at Chichén Itzá. Significantly, skeletal evidence retrieved from the Cenote of Sacrifice points to the sacrifice of young males, not females (see Coggins 1984; Price et al. 2019). Regardless, the story of female virgins sacrificed to appease rain deities remains popular amongst students and was explicit in their survey answers. Students recounted this story both textually and through drawings (Figure 9). The persistence of this account

Question	Answer Option
1. Of the cenote-related activities that you implemented with your students, what was the most effective activity?	Open-ended
2. What was the least effective activity or the one that was the most difficult to implement?	Open-ended
3. What was the most practical activity for you and your students? Were the same activities more practical and more effective?	Open-ended
4. What activities or topics seemed like favorites for your students? Why do you think that was so?	Open-ended
5. Have you been able to incorporate an oral history project into your classes during this academic year? If so, how did you link oral history to cenotes?	Open-ended
6. Do you think water quality testing and monitoring activities help students learn science?	Open-ended
7. Do you think that a concentrated study of cenotes with experiential activities will motivate the conservation of cenotes in the future?	Open-ended
8. Will you continue to teach about cenotes in the future? If so, what activities or themes related to cenotes will you repeat with your new students?	Open-ended
9. What other activities and topics have you thought about that can be related to cenotes and that could be implemented in your classes?	Open-ended
10. After implementing various activities about cenotes with your students, what activities do you think should be included in the workbook of activities that we will produce through this collaboration?	Open-ended
11. Of the resources that are available online and through organizations like InHerit and EarthEcho (a collaborator on this project), which ones will you use in the future? Do you feel that you have adequate information to access these materials for future use?	Open-ended
12. Do you feel like you can easily access the educational resources we have created for this project?	Open-ended

Table 4. Post-project teacher surveys.

indicates that communities and schools in Yucatán do not have access to current bio-archaeological evidence published in professional journals. Additionally, perhaps, this alludes to a tendency among academics to focus primarily on communicating findings within their own academic networks. Beyond themes of sacrifice, mythic narratives were also widely shared among communities and related the presence of giant turtles and the serpent, *Tzucan*. These creatures were said to surface at certain calendrical times. Other narratives mentioned a mysterious female spirit, the Xtabay, that emerges from the cenotes at night to lure drunken men to their death in the watery abyss below.

On both the preliminary and post-project surveys, student responses to questions reflected what was important to students in terms of cenote science and conservation. Questions 9 and 10 from the post-project survey asked if cenotes should be protected and, if so, how students themselves, might go about initiating and undertaking that protection. These questions were particularly important in clarifying the agency that Maya youth felt they did or did not have in terms of environmental

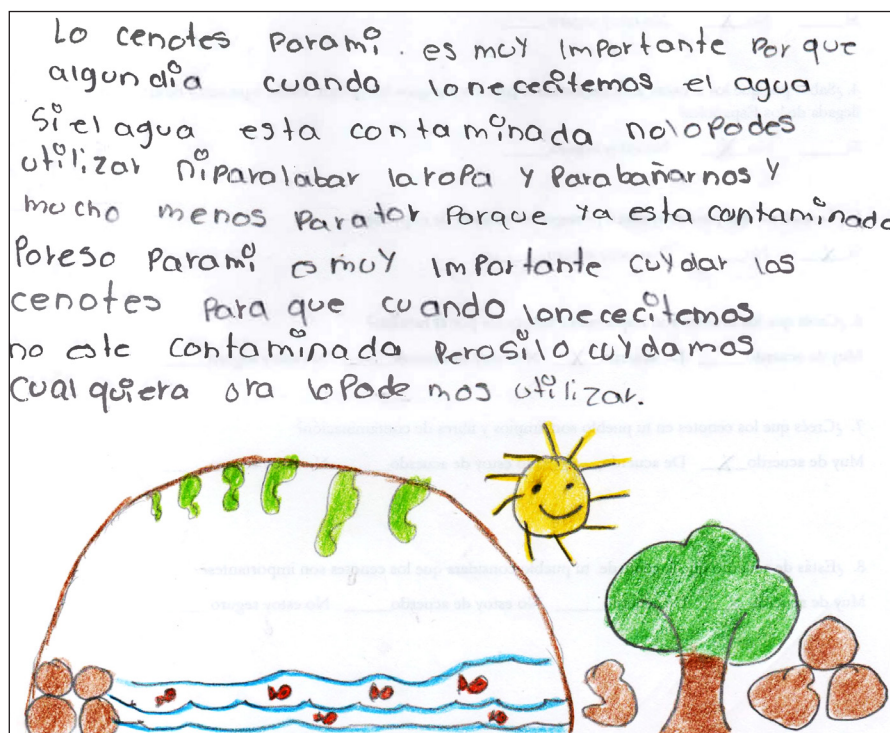


Figure 5. Written and drawn response from a student in Tahcabo, Yucatán to question 11 on the preliminary student survey.

conservation. These questions, along with Question 11 from the students' preliminary survey, provided dynamic, creative, and most-importantly, Indigenous student-driven perspectives on the importance of understanding and conserving cenotes in their communities. Many students cited the need to conserve cenotes because they were a main source of natural fresh water used for a variety of things. There also was a deep sense that these landscape features needed to be protected for future generations. A student from Tahcabo wrote the following:

“To me the cenotes are very important because when we need water, if the water is contaminated, you cannot use it to wash and bathe. That is why it is very important to take care of cenotes so when we need them, they are not contaminated. If we take care of them, we can use them now and in the future and other generations will be able to use them too.” (translated from Spanish by Ariana Ramirez)

When students were asked what more they would like to learn about cenotes, the majority responded that they wanted to know more about how cenotes formed, what was at the bottom of them, and their history in reference to the ancestral Maya. Students frequently mentioned that their knowledge of cenotes (prior to this project) came primarily from their grandparents or other elders in the community (rather than from classroom learning). This is reflective of the point that

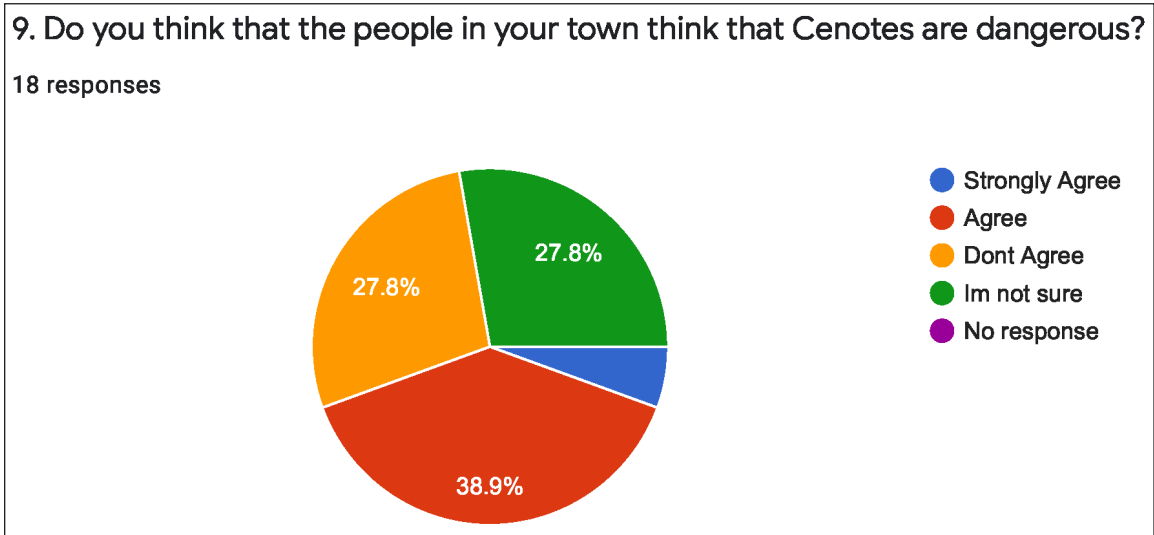


Figure 6. Chart generated from the Google Form depicting student data from Kaua, Yucatán.

for the Yucatec Maya, the landscape in which they live has traditionally had a *moral ecology*. As José Martínez-Reyes has beautiful said, the Yucatec landscape is, “the place where they [the Maya] feel “at home in the world,” where they are situated in an everyday engagement with their environment. It is also where their history, identity, spiritual beliefs, communion with other species, and ultimately their survival are rooted” (Martínez-Reyes 2016: 4). However, the students’ original responses indicate that *classroom* learning is not connected in any meaningful way to their local environment or to Indigenous or community histories (described above), which contributes to students’ feeling of alienation from formal education.

Divergent perspectives emerged when we compare student responses with those of their teachers. The divergence relates specifically to the long-term sustainability of the cenote curriculum in these nine communities and throughout Yucatán. In student answers on both preliminary and post-project surveys, learning about and making codices was a favorite activity and one that students were eager to see implemented in future classroom activities. However, teachers mentioned the activities related to the codices were among those they were *least* likely to implement, primarily because they did not feel equipped to lead classes on this topic. Lack of familiarity with Maya codices among teachers highlights the compelling need for better teacher training on the intellectual heritage of Maya literacy and bookmaking.

Another issue that accentuates the challenges of sustaining curriculum on/about cenotes concerns the rapid rotation of teachers from school to school. Unlike the U.S. system, K-12 teachers in Yucatán are frequently rotated (based on need) to other schools. A high teacher turnover rate creates issues with developing and sustaining a cenotes-focused curriculum. Yet, once teachers have access to cenotes-focused curriculum and training, the mobility of teachers could provide an opportunity for this curriculum to circulate widely throughout Yucatán. Broad dissemination of



Figure 7. Students from Ticuch, Yucatán analyze a facsimile of the Dresden Codex and identify cenote landscape features and deities associated with them. Photo by staff of CHECYC, 2018.

2000 paper copies of the teacher workbook—*Ciencia y Saberes de Cenotes Yucatecos* (Batún Alpuche et al. 2020)—to middle schools throughout the State of Yucatán will begin this year (2021). The book also is available as a free download from in-herit.org (select Resources for Teachers under the Resources tab). Such availability, hopefully, will augment the acceptance and utilization of cenotes curriculum.

The Take Away

The biocultural heritage of the cenotes in northern Yucatán is part of the region's highly significant local patrimony and ecology, but unfortunately this heritage has not been part of school curriculum long-term. Introducing and emphasizing these powerful and influential landscape features (Dedrick et al. 2021) into school curriculum can reduce student feelings of alienation and empower students to participate in conserving Indigenous knowledge about cenotes. As students actively braid together scientific knowledge of cenotes measured by water-quality testing and underwater drone observation with mythic and oral histories—both of which work towards sustaining the ecological health of cenotes—the tyranny of Western knowledge is mitigated.

Admittedly, decolonizing curriculum in this manner presents opportunities as well as challenges. Young students who are curious and energetic— while simultaneously part of rich Indigenous community knowledge systems— are very powerful. They have tremendous capacity to create change. As E. N. Anderson (2014) tells us, people must be emotionally involved in environments in order to save them. They must wish to learn specific information related to that environment, including how to think about long-term management. There must also be an interest in valuing and incorporating diverse problem-solving ideas. Lastly, there must be a realization that ‘we are all in this together’—that people are not

divorced from being in a relationship with landscape and environmental ecosystems. We feel Indigenous youth are uniquely situated to embody and act on these principals.

Increased access to educational materials related to Maya biocultural heritage opens the door to increased sustainability and ultimately preservation of a rich, Indigenous heritage. Student interest in water-quality testing, collecting oral histories, and creating codices demonstrates how efforts to decolonize the classroom and enrich student learning through experiential activities may set in motion dreams and futures that are not conceivable otherwise. Through opportunities for enhanced agency, students expressed their desire for a fresh pedagogy divorced from that of settler colonialism (following McAnany 2020; Veracini 2011). Not coincidentally, influential Indigenous scholars such as Eve Tuck have pursued a career in education precisely because of the role played by schools and universities in reproducing structures of inequality created by settler colonialism. How else could it be possible that middle-school students in Yucatán had never seen a facsimile of the codices created by their ancestors? How else could it be that teachers are not trained to teach Yucatec students about the tradition of literacy that existed among their ancestors

or about the tremendous significance of cenotes to Yucatec biocultural heritage? This last aspect points to the challenges yet facing decolonization efforts. We, as anthropologists and archaeologists (with access to university libraries, expert colleagues only an email or phone call away, and high-speed Internet) were particularly interested in creating curriculum related to the Maya codices. However, time and time again, community teachers mentioned that they were hesitant to teach a unit on the codices in future classes. They simply didn't feel they had the resources or training at hand to truly understand the complex history and content the codices embody.

Though the teachers' admission reflects one of many ways in which colonization ruptures a

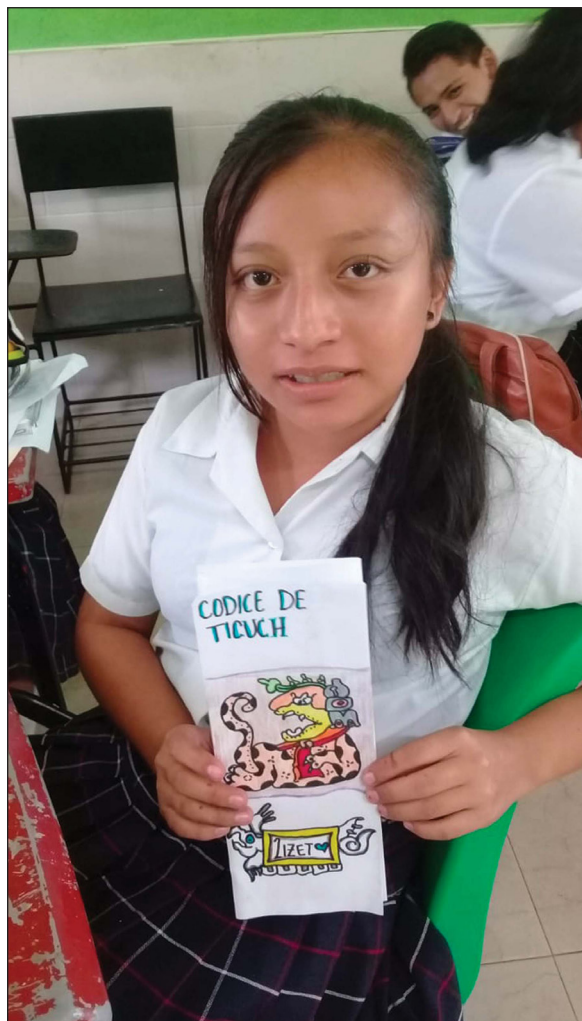


Figure 8. Alondra Lizhet Mazum, a student from Ticuch creates her own version of an ancestral Maya codex. Photo by staff of CHECYC, 2018.

relationship with land, biocultural features, and heritage, we remain hopeful and convinced that classrooms can yet be contexts for decolonization—places where fissures can be mended and new futures forged. It's also important to remember that classrooms can, and should, extend beyond traditional educational systems and even the four, physical walls of the classroom itself. Cenotes and their caves can be classrooms themselves, with much to teach us. In closing, we believe the Cultural Heritage, Ecology, and Conservation of Yucatec Cenotes initiative has been one effort to move beyond the rupture.

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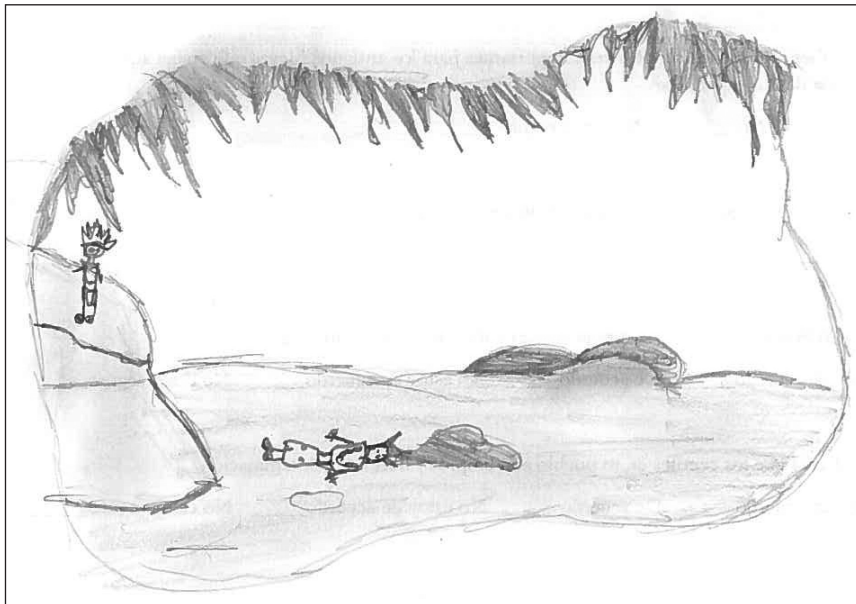


Figure 9. A drawn response to question 11 on the preliminary student surveys from Cuncunul, Yucatán. The drawing shows a sacrificed female within a cenote.

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