

TEACHER GRANT APPLICATION QUESTIONS

APPLICATION DEADLINE: Monday, March 7, 2022 at 5:00 pm

**BROOKLINE EDUCATION FOUNDATION
Teacher Grant Application for 2022-2023 Academic Year
Cover Page**

APPLICATION MUST BE TYPED

Project Title	Astronomy and Engineering in Pre-Hispanic Mexico
Name of Applicant(s)	Dominique Gonyer
School and Grades/Subjects You Teach	Baker Librarian, grades K-8
Telephone Number(s)	(617) 777-4520
Email Address(es)	dominique_gonyer@psbma.org, dominique.gonyer@gmail.com
Years Teaching in PSB, Total Years Teaching	This is my 21st year teaching, all in PSB. I taught French, Spanish and Latin from 2001-2019, mostly at BHS. Then I got certified as a school librarian, and have been the Baker librarian 2019-present.
Amount Requested	\$2312
Are you applying for the Charlie Baker Legacy Award?	No
Please list previous BEF grants (year, title, teacher/collaborative)	2015, Language and History in Quebec City, teacher grant *My last name was Aumiller at that time.

I understand that, should the Brookline Education Foundation fund my grant application, I am obligated to submit photographs documenting the grant, a written evaluation of my project at its completion and to present the results of my grant at a BEF sponsored event. Evaluations of projects completed during the summer will be due by December 31, 2022. Evaluations of projects completed during the school year will be due by May 31, 2023. Photographs may be submitted at any time. I further understand that only educators employed by the Public Schools of Brookline at the time the project is undertaken are eligible to receive funds.

Acknowledgement of Applicant(s):  Date: 03/03/2022

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Project Description Section

1. Project Summary (1-3 sentences)

I would like to spend six days in the Mexico City area, visiting the ruins of ancient structures. My focus would be on how pre-Hispanic civilizations incorporated geometry, astronomy, technology and engineering in the structures in Tenochtitlán (Mexico City) and Teotihuacán (a UNESCO World Heritage site north of Mexico City). I would like to use this new knowledge to foster collaboration with middle school math and science teachers, who do not often find a connection with the library. Then, I would like to work with students on an interdisciplinary STEM project inspired by the ancient Maya.

2. Goal Statement What are your explicit goals for the project? What would be the best outcome for the work you propose?

GOAL 1: Learn!

I would like to visit sites and learn more about the roles of astronomy, geometry, engineering and design in pre-Hispanic architecture and city planning. For example:

- Main streets, and buildings, such as temples, pyramids, palaces, observatories, and ball courts, were designed around significant astronomical events, including solstices, equinoxes, the shifting moon, or the rise of planets¹.
- Often windows would be aligned to feature the setting sun on solstices or equinoxes, or placed precisely so that the sun would light up the interior of rooms².
- Being oriented to sunrises and sunsets on significant dates made it possible to schedule agricultural activities and associated rituals in the yearly cycle³. For example, the street grid of Teotihuacán is oriented to the point where the Pleiades first appear at the horizon every year⁴.
- Ancient engineers in this area managed incredible feats, such as:
 - moving land and rivers⁵
 - transporting mica thousands of miles to be used as an energy conductor⁶
 - building a five-level round pyramid⁷

GOAL 2: Collaborate!

I am the K-8 librarian, but it is often hard to find ways to connect with grades 6-8, especially relating to science and math topics. Receiving this grant would help me collaborate with the middle school science and math teachers, and help students see the brilliance engineering feats of ancient, non-European cultures, as well as real world applications of the same principles they learn in science and math in grades 6-8.

Furthermore, and this is extremely important to classroom teachers, I could use *library* time to teach lessons that supplement what they are learning in science or math classes. For example, when 8th graders are learning about astronomy in science class, they could come to the library for an activity about how the ancient Maya people studied the skies. Or when 6th graders start learning about ratios and proportional relationships in math class, we could look at the construction of ancient pyramids. The possibilities are endless, and fostering

this type of relationship with the middle teachers and students would lead to more collaboration in the future.

My proposal aligns with the Massachusetts Curriculum Frameworks in the following categories⁸:

- Science: Earth and Space Sciences Standard ESS1: Earth's Place in the Universe, grades 6 and 8
Technology/Engineering Standard ETS1: Engineering Design, grades 6, 7 and 8
Technology/Engineering Standard ETS2: Materials, Tools, and Manufacturing, grades 6 and 8
- Math: Ratios and Proportional Relationships, grades 6 and 7
Geometry, grades 6, 7 and 8
Expressions and Equations, grade 8

3. **Context** - What experiences (inside or outside the classroom) have led you to apply for this grant?

I taught Spanish (and French and Latin) in Brookline for 18 years before becoming the Baker School librarian, and I have always been fascinated with ancient Mesoamerican civilizations. I love the art and the myths (so many jaguars!), and am astounded by the ancient Mesoamericans' capacities in geometry, astronomy, technology and engineering.

I would like to learn more and share it widely, because despite our best efforts at multiculturalism, our culture is still very Eurocentric. The Brookline schools do an amazing job teaching history from many perspectives, which I've seen as a parent of two children growing up in Brookline (currently in grades 8 and 11), and as a long-time employee of Brookline High School. I assume that students are taught about Pythagoras and Archimedes in math classes, and Copernicus and Galileo in science classes, but there are unnamed superstars of math and science who lived in the Americas (and Africa and Asia, of course).

I would love to teach students about some of the advanced accomplishments of the pre-Hispanic Americas, especially since our country has a fraught relationship with non-white immigrants. Even with Mexico as our neighbor, most Americans do not admire Latin America's contributions to the world, beyond food and music. Latinx students would have a reason to feel proud, and might be amazed by their ancestors' contributions to the world. Other students would also benefit from learning that the Americas were doing quite well before (or until) the colonizers arrived. I know from years of teaching that everyone can benefit from looking at history from the perspective of subjugated or conquered people. What if students were to learn about the advanced engineering and math in ancient Mesoamerica? Information like this:

...the pre-classic Maya and their neighbors had independently developed the concept of zero (Mayan zero) by at least as early as 36 BCE, and we have evidence of their working with sums up to the hundreds of millions, and with dates so large it took several lines just to represent them. Despite not possessing the concept of a fraction, they produced extremely accurate astronomical observations using no instruments other than sticks and were able to measure the length of the solar year to a far higher degree of accuracy than that used in Europe (their calculations produced 365.242 days, compared to the modern value of 365.242198), as well as the length of the lunar month (their estimate was 29.5308 days, compared to the modern value of 29.53059).⁹

Students could greatly benefit from learning that Mesoamerican civilizations were at least as advanced as Spain, if not more so, when Spaniards first arrived in 1519. Led by Hernán Cortés, when the Spaniards arrived in the ancient city of Tenochtitlán, they saw an enormous, sophisticated city, and Cortés compared its size to that of Seville or Cordova¹⁰ in Spain. With 400,000 people¹¹, it would have been one of the largest cities in the world at that time, with potable water brought in by aqueducts, drainage systems, paved streets,

apothecary shops, markets that sold items from all over Mesoamerica, and more, as Cortés wrote in a series of letters to King Carlos V of Spain:

I shall not be able to relate an hundredth part of what could be told respecting these matters but I will endeavor to describe, in the best manner in my power, what I have myself seen; and imperfectly as I may succeed in the attempt, I am fully aware that the account will appear so wonderful as to be deemed scarcely worthy of credit; since even when we who have seen these things with our own eyes, are yet so amazed as to be unable to comprehend their reality¹².

Finally, if awarded this grant, I would get a chance to restore my love for learning and teaching. These covid-affected years have been astonishingly difficult. Teaching has always felt exhausting, but the pandemic has sapped most of the joy from the profession. Near impossible tasks, such as keeping 20 children 6 feet apart, and a seemingly infinite chain of "one more thing" became a soul-crushing burden, each day laced with the fear that failure to adequately clean everything from the library tables to the actual books themselves (between every class!?) could possibly lead to someone dying from covid-19.

4. Project Description

Describe the structure of this grant. What is your time frame? When and where will you be working? With whom will you work? You may include copies of supporting material (e.g., conference brochure, tour itinerary). Links to websites may be used for supporting materials and are preferred, if available.

Date	Plan
8/3/22	Fly to Mexico City
8/4/22	Visit Templo Mayor Museum and archaeological site
8/5/22	Full-day guided tour of the archaeological complex of the ancient city of Teotihuacán. Includes food, bottled water, tour guide, admission to Teotihuacán Culture Museum, visit to an obsidian workshop, and transportation to and from Mexico City.
8/6/22	Visit murals depicting various epochs of Mexican history at the Central Library of the Universidad Nacional Autónoma de México (UNAM). Visit Cuicuilco, a five-level round pyramid
8/7/22	Visit National Anthropology Museum
8/8/22	Visit Aztec ruins of Tlatelolco, in the Plaza of Three Cultures Visit the Floating Gardens of Xochimilco, which use ancient Aztec canals
8/9/22	Fly home to Boston

5. Impact

a. Describe as specifically as possible the impact of the work you propose:

- On Yourself - How do you expect this project will change you as an educator? How might this work impact future professional activity?

It is understandable to see a school library as a focus point for literacy, and I thoroughly enjoy reviewing, selecting and purchasing fiction and nonfiction for all kinds of readers. That said, the library's role as a place of research is equally important, and can also be fun and engaging. As a librarian, I am in a unique position to work with students and teachers on *any* topic, and as an infinitely curious person, I feel very lucky. This grant would help me promote the library as a place where all types of learning takes place. It would allow me to connect a topic I love (ancient Mesoamerica) with learning that is currently happening in the middle school science and math classes. I expect that this experience would lead to more collaboration with middle school teachers of science and math, and would stimulate new ideas on how to develop the library collection, library programming, and student learning experiences. I am in the perfect position to facilitate interdisciplinary work.

- On Your Colleagues - What impact will your project have on your professional community, either directly or indirectly?

Teachers of science and math would have their curricular topics reinforced and supplemented by library lessons. Furthermore, my interdisciplinary work with science and math teachers would lead to the creation of teaching materials that could be used by educators all over Brookline. There could even be future collaboration with teachers of Spanish at BHS, where we could translate certain teaching materials into Spanish for use in intermediate or upper level Spanish classes. Finally, this type of collaboration would also help me continue to improve the library's nonfiction print book collection in the science and math topics, which would benefit teachers and students alike.

- On Your Students

a. How will your students benefit from this project in the short or long term?

In the short term, students would get to see real-world applications of geometry and engineering principles, and might marvel over how it was accomplished without modern tools. Students would also start to consider the library as a place of learning about *any* topic, and that library resources aren't just for English and history classes.

In the long term, this project would challenge preconceived notions of which cultures get to be considered "advanced". It could lead to conversations about the accomplishments of other developing regions of the world, and of how European colonialism negatively affected communities in the Americas, Africa, Asia and Australia. Students of Latin American descent might feel proud of their ancestors' accomplishments, and any student might become interested in learning more about world civilizations.

b. How will you **evaluate** the success of this project?

I would feel successful if I were able to bring my new knowledge back to Baker, and work with students on an interdisciplinary project. "New knowledge" would include photos, maps, and online materials that could be used to enrich their understanding of ancient Mesoamerican accomplishments in engineering, and especially the

relation to astronomy. Furthermore, I would feel successful by reiterating the interdisciplinary reality of learning, ie, history doesn't just belong in history class.

6. Dissemination

How will you share your learning with others in your school and district community? For example, will you share it departmental or school meetings, in an online format, or design other forms of dissemination of your project?

I would like to:

- Collaborate with middle school teachers of science and math, as to how best support their curricula, and then...
- Teach students about what I learned, and work with them to apply their classroom knowledge to a library-based STEM project, whether online, on paper, or a 3D construction. I'm particularly interested in some of the projects in a book called *Amazing Maya Inventions You Can Build Yourself*, which includes:
25 creative, educational, hands-on projects. Covering everything from the 20-base numbering system to the Maya's extensive trade relationships, kids learn about appeasing the gods with a "jade" ceremonial mask, language development with a screen-fold book for drawings and hieroglyphs, and Maya astronomy with a sand art picture of the cosmos. Informative text and sidebars teach about the Maya's impressive achievements in science, math, language, music, medicine, and architecture; and their daily activities and management of natural resources.
- Share materials I gather and create with other PSB librarians to foster similar collaboration in their schools
- Investigate collaboration with teachers of Spanish

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Budget and Finances Section

Expense	Purpose	Cost
Materials and Supplies	Lonely Planet Mexico tour book, paperback from the Brookline Booksmith	\$30
Travel and Accommodations* <i>please include applicable taxes.</i>	Round-trip flight, Boston to Mexico City Aug.3-9: six nights JW Marriott Hotel, Mexico City Andres Bello No 29 Mexico City, CDMX, 11560	\$600 \$1500
Admission and tour fees	<ul style="list-style-type: none"> • Templo Mayor Museum and archaeological site • Full-day guided tour of Teotihuacán (see Project Description for details) • National Anthropology Museum • Aztec ruins of Tlatelolco, Plaza of Three Cultures • Floating Gardens of Xochimilco, which use ancient Aztec canals 	\$4 \$88 \$4 \$1 \$15
Other	Uber from airport to downtown Mexico City is listed on uber.com as costing MX\$259 (= USD \$12), so estimating that I would need about \$70 worth of Uber rides	\$70
TOTAL		\$2312

Finances

a. Will there be additional funding from other sources? Please describe.

No

b. Are resources needed to continue the work of the project after BEF funding ends? If yes, please describe how these resources will be obtained. If no, please describe how the work of the project will be funded or continued after completion of funding by the BEF.

I will use part of my library budget to purchase books for the library collection that would help me to continue this project.

c. Do you foresee any potential challenges /obstacles and, if so, what is your strategy for dealing with them should they occur?

If a location is closed, I will go to another site, or change the order of the itinerary. If there is another wave of covid, I am pretty certain that I would still go on this trip, since I am completely vaccinated and boosted.

d. Will you be able to complete the project if only partial funding is available? No

If only partial funding is available, would you be able to redesign the project? Not really...

Please explain:

This project is already a simplified version of one I originally wanted to organize: visiting the major ruins on the Yucatán Peninsula of Mexico. I thought it would be too much money to ask for, and decided to trim the trip down to just be around Mexico City. Even so, I have left out sites that are more than a 1 hour drive from Mexico City.

¹<https://www.exploratorium.edu/ancientobs/chichen/HTML/alignments.html#:~:text=Proof%20of%20the%20Mayan%20fascination,t o%20celestial%20bodies%20and%20cycles>

² <https://ancienthistory.abc-clio.com/Search/Display/817506?terms=aztecs&sTypeId=2>

³ <https://www.thoughtco.com/ancient-maya-astronomy-2136314>

⁴ <https://www.amazingplaces.com/mexico/teotihuacan/>

⁵ <https://www.smithsonianmag.com/smart-news/ancient-engineers-moved-land-and-bent-rivers-to-build-teotihuacan-180978735/>

⁶ <https://sacredsites.com/americas/mexico/teotihuacan.html>

⁷ <https://www.worldhistory.org/Cuicuilco/>

⁸ <https://www.doe.mass.edu/frameworks/current.html>

⁹ <https://www.storyofmathematics.com/mayan.html/>

¹⁰ <https://www.historians.org/teaching-and-learning/teaching-resources-for-historians/teaching-and-learning-in-the-digital-age/the-history-of-the-americas/the-conquest-of-mexico/letters-from-hernan-cortes/cortes-describes-tenochtitlan#:~:text=The%20city%20is%20as%20large,and%20are%20navigated%20by%20canoes.>

¹¹ <https://www.britannica.com/place/Tenochtitlan>

¹² <https://www.historians.org/teaching-and-learning/teaching-resources-for-historians/teaching-and-learning-in-the-digital-age/the-history-of-the-americas/the-conquest-of-mexico/letters-from-hernan-cortes/cortes-describes-tenochtitlan#:~:text=The%20city%20is%20as%20large,and%20are%20navigated%20by%20canoes.>