

Making a StINK with STEM in the Classics Classroom: Exploring Ancient Roman Writing through Experimental Archaeology

by Nathalie Roy

Have you ever wondered what it would be like to take notes for Pliny the Elder? Surely he had a secretary to assist him with his writing, or did he take his own notes? He left a huge body of material in his *Historia Naturalis*. What must his home office have looked like with all the detritus of constant writing and research scattered about? I have often wondered these things and many others about the process of ancient writing. As a Latin teacher, I decided to try out ancient writing with my students as a STEM project.

STEM, an acronym for science, technology, engineering, and math, has been an educational buzzword for the past ten years or so in the United States. With its growing need for engineers of all kinds, the US has stressed the importance of developing STEM programs at all levels of education so that children get accustomed to STEM thinking at an early age. Many schools hire science “instigators” (education speak for coordinators or facilitators) to assist teachers with integrating STEM activities in every area of the curriculum. For example, students in a middle school social studies class might throw projectiles with atlatls, a Native American hunting tool, to learn about the lives of our early ancestors. Students in elementary physical education class might learn to track heart rates using graphs and charts. These activities relate to the content area of the class but add a little STEM into the mix.

At a school of just this kind, I found myself wondering why I, as a Latin

teacher, could not do the same thing with my students. After all, the Romans were STEM geniuses. I had seen countless television shows about Caesar’s army building bridges (Cannon, 2005-07), Trajan’s architects designing and building his column (Weise, 2015), and modern engineers trying to reproduce the elevator system that made lions appear on the floor of the Colosseum (PBS, 2015). And what about all the aqueducts and the heated baths? The more I thought about it, the more I was convinced that I could integrate STEM into Latin classes.

Fast forward two years, and I’m now teaching a full-year class called Roman Technology. The goal of the class is to reproduce the products and processes of ancient Roman daily life using experimental archaeology. Every 90-minute class consists of two segments: 1) a short lecture about how we know about a particular aspect of the ancient world whether it be through the archaeological or literary record, and 2) a hands-on interactive lab in which students get to experience, first-hand, a product or process of the ancient Roman world by actively reproducing it. Dr. Alan K. Outram calls experimental archaeology “‘actualistic’ experiments that test out hypothetical scenarios using potentially authentic materials and conditions” (Outram, 2008, p.1).

In the class, we explore units of study such as household crafts (spinning, weaving, making Roman leather *bullae*), personal beauty (hairstyling, makeup),

record keeping (abacus, finger signalling, wax tablets, papyrus, ink, sundials), food (wine flavourings, bread), hydraulics (aqueducts, water screws, baths), warfare (shields, catapults), and construction (concrete mixing).

The culminating project of last year’s class was building a 20-foot interactive analemmatic sundial with decorative mosaic designs. When standing on the current month, the viewer’s shadow indicates the correct time. For this project, the students read about the analemma described by Vitruvius in Book IX.7 and the *horologium Augusti* (the sundial of Augustus located near the Ara Pacis) described by Pliny the Elder in Book XXXVI.72. They learned to use compasses, oriented to true north, and measured the hour markings on the sundial using x/y coordinates. In addition, they learned to use mosaic hammers and hardie wedges to cut marble stone tesserae, designed mosaics, laid the stone into mortar, grouted it, and cleaned it. Our monument, even though small in comparison to Augustus’, stands as a testament at our school to the power of STEM integration in a humanities course.

As you’ve probably guessed, these projects are costly. Luckily, there are grants available to assist with STEM integration projects. With such grants, I was able to fully fund my Roman technology class for one year, purchasing some equipment and supplies which will be reused from year to year. To find STEM grants in your area, be sure to ask

your school administrators or grant writer if one is employed in your district. If your area has petrochemical or other industry nearby, visit the websites for their companies and look for grant opportunities. If the grants specifically ask for STEM connections in your curriculum, be sure to draw attention to the use of ancient sources for STEM. It seems to catch the eye of the grantors (or so has been my personal experience so far).

Responses to my presentations on this class from fellow Latin teachers generally have been, “That sounds fantastic, but I don’t understand math” or “but I’m not qualified to teach science” or “but I don’t have the money to do projects in my classroom” or “but I’m on a strict curriculum timeline, and we don’t have time for lengthy projects”. If you’re one of these teachers, or you just want to try out a STEM project for the first time in your Latin class, this article is for you. I will detail two simple, inexpensive, and quick projects that are light on the science and heavy on the fascinating and fun.

Both these projects, from my Roman technology class’s unit on record keeping, are tried and true favourites with my students and involve writing in the ancient world: writing with reed pens and squid sac ink on papyrus and writing with a metal or wooden stylus on wax tablets.

Project 1: Papyrus and reed pens.

I begin the unit by asking how we (modern people) know about writing in the ancient Roman world. There are many sources for the study of papyrus, or papyrology. Students should have a general idea of what the sources for our collective knowledge of this area of classical studies are. It gives them ideas for future careers and deepens their understanding of how we know about the ancient world.

A helpful online resource for papyrology is the University of Michigan’s “Papyrology: K-12 and General Resources”. It even features a step-by-step slideshow of how papyrus was made. I’ve never tried making the stuff myself, but I know those who have, and I think it could make a good future project for my students. It is completely doable by students after the papyrus plant is cut up

by an adult with a sharp knife. The actual process of assembling papyrus strips into sheets is fascinating to see in action. After being presented with this information, students should come to an understanding of how time-consuming and expensive papyrus production was. If you don’t want to try making your own, it is still made regularly in Egypt and readily available from online stores.

Students should also know how papyrus sheets were glued together into long rolls, attached to a wooden dowel with knobs at each end, and written on horizontally to express chapters worth of text. They should also be introduced to the work being done to read the Herculaneum scrolls, charred by the 79 CE eruption of Mt. Vesuvius. They are only now being read in the past couple of years, without the destructive process of unrolling, using sophisticated x-ray technology (Marchant, 2018).

A very interesting papyrus phenomenon is the palimpsest, or a papyrus which has been recycled by erasing it and writing over it. The residue of the original writing leaves traces detectable by scholars, and the manuscript then becomes a double one with remainders of both texts. The word is ancient Greek for “scraped”, and students enjoy seeing pictures of these and asked to reflect on why they were recycled, which writing came first, and how modern scholars are able to interpret them. A Nova television programme tells the story of the Archimedes palimpsest and how it came to be (Tucker, 2002).

A number of frescoes from Pompeii contain images of writing utensils including papyrus with a leather label containing its title (Meyer, 2009). Copyright issues keep me from including those here, but a simple online search is helpful. Students like to see what these looked like.

Using ink to write with at some point meant having to erase it, and the Romans had a method for this process too. They used sea sponges moistened with water. Students find sea sponges fascinating, especially when reminded of their other, more commonly-known use - as toilet paper. When my students first felt a dry sea sponge, they could not understand why any person would want to use it as a wiping device for such a tender area of the body. They were utterly amazed to compare the difference in texture and

softness when examining a moistened sea sponge. A wet sea sponge is effective as an eraser too, and students should experiment with this process.

After introducing students to at least one or two of the above sources for how we know about ancient Roman writing, it’s time to introduce a short text on ancient writing. Since most ancient writing about technical things is not canon literature, it’s difficult to find texts that are annotated and glossed for beginning students. To help with this process, I copy and paste the text from the Perseus Digital Library into NoDictionaries.com, create a simple vocabulary, and discuss any odd Latin forms with the students as we go through the text together. Reading unusual texts with no commentary can be a time-consuming and frustrating process sometimes so choosing texts far in advance is a wise choice.

Suetonius, in his *Divus Augustus*, 85, describes Augustus discussing a tragedy he was writing about the mythological character of Ajax. Evidently, the experience did not go well:

multa varii generis prosa oratione composuit, ex quibus nonnulla in coetu familiarium velut in auditorio recitavit, sicut “rescripta Bruto de Catone,” quae volumina cum iam senior ex magna parte legisset, fatigatus Tiberio tradidit perlegenda; item “hortationes ad philosophiam,” et aliqua “de vita sua,” quam tredecim libris Cantabrio tenuis bello nec ultra exposuit. poetica summam attigit. unus liber exstat scriptus ab eo hexametris versibus, cuius et argumentum et titulus est “Sicilia”; exstat alter aequae modicus “epigrammatum,” quae fere tempore balinei meditabatur. nam tragoediam magno impetu excorsus, non succedenti stilo, abolevit quaerentibusque amicis, quidnam Ajax ageret, respondit, Aiaceum suum in spongiam incubuisse.”

He composed many tracts in prose on various subjects, some of which he read occasionally in the circle of his friends, as to an auditory. Among these was his “Rescript to Brutus respecting Cato.” Most of the pages he read himself, although he was advanced in years, but becoming fatigued, he gave the rest to Tiberius to finish. He likewise read over to his friends his “Exhortations to

Philosophy” and the “History of his own Life” which he continued in 13 books, as far as the Cantabrian war, but no farther. He likewise made some attempts at poetry. There is extant one book written by him in hexameter verse, of which both the subject and title is “Sicily”. There is also a book of epigrams, no larger than the last, which he composed almost entirely while he was in the bath. These are all his poetical compositions: for though he begun a tragedy with great zest, becoming dissatisfied with the style, he obliterated the whole; and his friends saying to him, “What is your Ajax doing?” he answered, “My Ajax met with a sponge”. (Note: *in spongam incubuisse*, literally has fallen upon a sponge, as Ajax is said to have perished by falling on his own sword).

Perhaps, as the note suggests, he meant that Ajax had fallen on a sponge stick (the kind used in a public toilet), but he surely also meant that Ajax got erased from the papyrus. In either interpretation, we understand that the final draft was not pleasing to Augustus and was erased.

After reading the text with students, it’s time to try out writing and erasing on papyrus. I like to have the following things on hand: plastic cups (for use as inkwells), plastic spoons for mixing, paper towels, disposable wipes, and a water source/sink (if possible). You’ll need the following items, all available from online suppliers:

1. Papyrus, cut into smaller practice pieces, 10 large pieces cost about \$20 and will be enough for about 50 students to have practice pieces.
2. Cuttlefish ink, a 3.2 oz jar costs about \$15, and it will be plenty for about 100 students.
3. Reed pens, a pack of 3 bamboo reed pens (usually used for calligraphy) costs about \$7, and students can possibly share, but I like each student to have his/her own pen.
4. Sea sponges, a pack of 12 costs about \$11, and they can be cut down to mini-size to be used as erasers.

Before students arrive, prepare by scooping out a half teaspoon of ink into

each plastic cup and adding about the same amount of water. Adjust the mixture as necessary - it may need more or less water. Mix the contents of each cup and set aside. Prepare sponges by wetting them with water and wringing them out. Cut pages of papyrus into 3 inch × 6 inch pieces.

Prepare for students to be visibly and olfactorily taken aback by the look and smell of the very black and smelly ink of the cuttlefish. It has a strong fishy odour (which miraculously disappears after it dries). You may also want to share that modern chefs use it to prepare black ink pasta dishes; thus, it is edible.



Once each student has an inkwell, pen, and papyrus, ask the students to pretend to be ancient Roman scribes - recite a Latin passage you want the “scribes” to copy; it could be a simple passage from your current textbook or a Catullus poem. Have them check for errors which they will need to erase with their sponges. Or ask them to write something meaningful to them - many students like to copy song lyrics. Whatever you choose to do with the materials, remember to guide them in reflecting on the process afterwards, and consider questions like, “What would it be like to work with smelly ink all day long, as copyists would do? Would you want to do your homework on papyrus every night? Why or why not? What kind of Roman could afford papyrus and ink to write with? What did ancient Roman libraries look like?”

Project 2: Wax tablets.

Unlike papyrus, which the Romans used for more enduring purposes, wax tablets were the Romans’ daily writing tools, and they are surprisingly simple to recreate and use with students. Before making

them, remember to explore the sources for them with your students.

I begin the unit by explaining to students how they were made using thin pieces of wood, the centre part of which was hollowed out and filled with beeswax tinted with black soot from oil lamps. The wax was scratched into with metal or bone styli. A wonderful source of information about them is the Vindolanda tablets, online and searchable. And don’t forget about the Bloomberg tablets, uncovered in London in 2010-13, detailed in a video about how they are deciphered by Roman handwriting expert, Dr. Roger Tomlin.

The same Pompeian frescoes which contain images of papyrus and inkwells also have images of wax tablets so be sure to do an online search for them to show students. (Ask if students can name the various items in Latin as they look at the images (papyrus, *sepia* or *atramentum* for ink, *calamus* for reed pen, *stylus* for metal stylus, *tabulae*, *tabellae*, or *cerae* for wax tablets, etc.).

Next, choose a text about writing on wax tablets that’s appropriate for your students’ level. My favourite is Ovid’s *Amores* I.11 about Nape, the slave girl of his girlfriend Corinna. In this poem, Ovid asks Nape to deliver a love note in wax tablet form to his girlfriend. It is rich with detail about how wax tablets might have been used as a form of everyday communication.

*colligere incertos et in ordine ponere crines
docta neque ancillas inter habenda Nape,
inque ministeriis furtivae cognita noctis
utilis et dandis ingeniosa notis
saepe venire ad me dubitantem hortata
Corinnam, 5
saepe laboranti fida reperta mihi —
accipe et ad dominam peraratas mane
tabellas
perfer et obstantes sedula pelle moras!
nec silicium venae nec durum in pectore
ferrum,
nec tibi simplicitas ordine maior adest. 10
credibile est et te sensisse Cupidinis
arcus —
in me militiae signa tuere tuae!
si quaeret quid agam, spe noctis vivere dices;
cetera fert blanda cera notata manu.*

*dum loquor, bora fugi. vacuae bene redde
tabellas, 15*
verum continuo fac tamen illa legat.
adspicias oculos mando frontemque legentis;
et tacito vultu scire futura licet.
nec mora, perlectis rescribat multa, iubeto;
odi, cum late splendida cera vacat. 20
*conprimat ordinibus versus, oculosque
moretur*
marginē in extremo littera rasa meos.
*quid digitos opus est graphio lassare
tenendo?*
hoc habeat scriptum tota tabella ‘veni!’
non ego victrices lauro redimere tabellas 25
nec Veneris media ponere in aede morer;
*subscribam: ‘Veneri fidas sibi Naso ministras
dedicat, at nuper vile fuistis acer.’*

This translation is from A.S. Kline (2001):

Skilled at gathering unruly hair and setting it in place
Nape’s not just an ordinary lady’s maid,
she’s known to be useful in the secret service
of night: clever at carrying messages between us:
often exhorting a hesitant Corinna to come:
often faithfully labouring to find things out for me –
here take these wax tablets by hand to my lady
and be sure to avoid obstructions and delay!
There’s not stony vein or harsh metal in your breast,
older than the others, there’s no foolishness in you.
It’s easy to believe that you’ve felt Cupid’s arrows –
see the traces of your battles in me!
If she asks how I am, say I live in hope at night:

you’ll carry the rest in your hand, flattering waxen words.

While I speak, time flies. Give her them when she’s free,

make sure though that she reads them straight away.

Watch her eyes and brow as she chews them over:

and know that a silent face may show the future.

When she’s read it I need a long reply, and no delay:

I hate it when the clear wax is mostly empty.

Let her squeeze the lines in ranks, and hold my eyes

with letters that graze the edges of the margins.

Why should she weary her fingers holding a pen?

One word can take up the whole tablet: “Come!”

I won’t hesitate to wreath the victorious tablets with laurel

and set them up in the centre of Venus’ temple.

I’ll write: “Naso dedicates these loyal servants to Venus,

these tablets that till now were worthless maple-wood.

This poem makes me think of modern texting when you’re waiting for the person to reply to your text and you see the three ghostly dots flashing on the screen. Waiting for a response can be hard, and the modern world is no different, just quicker.

It’s time to assemble wax tablets to use in class. I like to have the following things on hand: an old coffee cup you don’t plan to use again, a cooking pot, a hot plate that can boil water, plastic spoons for mixing, and a water source/sink (if possible). You’ll need the following items, all available from online suppliers:

1. Beeswax, a 32 oz bag costs about \$15, and should produce about 50 tablets.
2. Carbon black, a .75 oz jar costs about \$7, and it will be plenty for all the tablets you’ll make.

3. Manicure sticks to serve as styli, a pack of 100 costs about \$6. These can be more authentic with greater cost. Some artisans actually make and sell them on sites like Etsy.com. They are pricey; therefore, I recommend going with the less authentic option here.

4. Cheap wooden photo frames for crafting, a set of 10 costs about \$23, but local craft stores generally sell them much cheaper. Better than this would be a woodworker friend with a router who can take thin slices of wood and hollow them out. The Roman process most likely involved a wood chisel and hammer. If you want to try this method yourself, the Bloomberg video linked in the bibliography goes into some detail about that.

5. Packing tape or duct tape, 1-2 rolls cost about \$10.

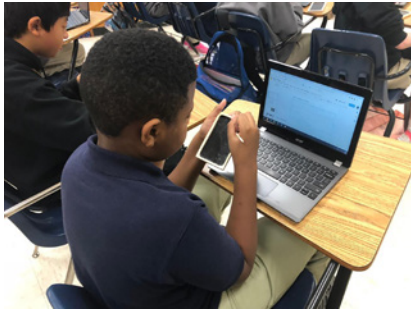
6. Sandpaper of low grit (optional), 1 pack costs about \$5, and can be cut into smaller pieces.

Start by having students sand their wooden picture frames. They may want to remove the stand from the back of the frame - the stand is not necessary for this project and may hinder the taping process later. Students generally enjoy sanding wood, and it will make their tablets smooth for later use. Next, they will need to cover the back of their frames with tape that prevents leaking - parcel packing tape will do the job - make sure they secure all the seams in the wood that might leak melted wax.

While students are working on getting their tablets ready, you can begin heating up the wax. Boil water in a large saucepan - make sure that there is not too much water. The coffee cup should be able to sit in the boiling water without being submerged completely. Fill the old coffee cup about half full with beeswax pellets. Add two large tablespoons of carbon black. Being careful not to allow students to come too close, insert the old coffee cup in boiling water and allow the beeswax to melt, stirring carefully every once in awhile.

Students should be finishing up their tablets and laying them on a flat surface near the heating wax. It's important that the wax tablets are completely flat, or the wax will quickly dry unevenly and create an ineffective wax tablet.

Once the wax has melted, using a pot holder or old cloth, lift the coffee cup by its handle out of the water. Immediately begin pouring the wax into the tablets. Take care to pour only a thin layer of wax in each tablet.



While the wax is hardening and the tablets are settling (about 10-15 minutes), you may want to introduce your students to a Roman cursive handwriting tutorial (Millner, 2014).



Once the tablets are dry, the students will use their styli to incise the wax with writing. Before they begin trying it out, have a purpose for them. Examples might be trying to write the newly-learned Roman cursive alphabet or writing on their tablets as if sitting on a bench and using their knees as a desk, as Roman children did (Maurice, 2013). To erase, show them how to use the blunt end of the stylus to scratch out wax. Excess wax from the erasing can be balled up and put into a corner of the tablet for recycling later. If the wax in the tablet seems too cold and brittle, have the students place the tablet between their legs or in their armpits. The natural heat of the body helps to soften the wax.



If you plan to allow the students to keep their tablets, give them an assignment to complete on the tablets and return the next day. My students attended a re-enactor day fair to which they brought their tablets and took notes on presentations they saw. To erase a tablet completely for re-use, lay the tablet in a sunny spot outside or put it in a lightly-heated oven.

To finish up this project, don't forget to ask the students to reflect on the process of writing with wax tablets and styli. Questions to consider might be, "To whom might you send a wax tablet message? What would it be like awaiting a response? Where does wax come from, and how is it produced?"

Looking Ahead

Now in its third year, my Roman technology class's enrollment has grown by 25%. It would have grown by a larger percentage, but equipment for the class is limited. In addition, since safety can become an issue with some tools, the classes are kept to around 20. This year, there are two classes of 21 students each. Sadly, many interested students had to be turned away.

The class has also built an interest in the Latin classes offered. Although most students come to the school with experience in either French or Spanish (the two most popular languages in the state of Louisiana), some are not allowed to study a second language because they are behind in their reading test scores and

must do remediation classes in English. If it were not for the Roman technology class, these students would not have a chance to study the classical world in depth. The class has been an effective way to get students interested in studying about the classical world.

This year's big project will be the construction of wood-firing kilns in which we plan to fire our own hand-made pottery. We will attempt to build votive human body parts, wine cups, and gliraria (for fattening up dormice, or in our situation, a fellow teacher's pet mice - and no, we don't plan to eat them).

More than anything, small projects like these guide classical studies students in seeing what it was like to live the daily experience of an ancient Roman. Reading what Romans wrote, looking at pictures of what they made, and even visiting places where they lived can fall short without the actual experience of doing what they did. In education, the study of doing and the practice of doing to learn are often overlooked. Students love to actually do things. As a Latin teacher, I've had many a student claim he cannot conjugate a verb or read a Latin passage, but I've never had a student say she didn't want to try to write the ancient Roman way. Simple STEM activities like the ones detailed above can be memorable and illuminating experiences for students at all levels and abilities. They bring a hands-on understanding of the classical world.

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