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Cambium

VOL. 6, NUMBER 1

INNOVATIVE K-8 CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

EVERYDAY ARTS

This is the year Arbor School will finally break ground for a long-dreamed-of Gathering Center, a proper auditorium that can welcome our full community for all-school performances like Winter Solstice while also housing daily music and movement classes. With this new venue so tantalizingly close to construction, and in thanks for the groundswell of community support that has made its realization possible, we felt it only appropriate to devote a Cambium issue to the expressive arts.

A key tenet in our educational philosophy is that art is not confined to the theater or studio. It spills into and wells up from every discipline and every classroom across the school. This is a year when we could focus on the banner effort of the Senior production of "A Midsummer Night's Dream," but instead these pages will reveal the arts in action in subtle ways throughout the curriculum, helping children to express their thinking and understanding. We'll examine how math drawings help Primaries bridge from relying on manipulatives to calculating with numbers. We'll see how careful artistry and attention to detail let Senior science students accurately identify invertebrate specimens. We'll follow the Intermediates as they memorize and recite large portions of *The Odyssey*. And in Senior Humanities we'll track a unit introducing the Great Migration of African-Americans through primary-source arts and letters and watch as the students encapsulate their learning in creative responses of their own.

Come visit us in 2016, when we fling wide the doors of the Gathering Center to explore all the expressive arts, from the everyday to the extraordinary.

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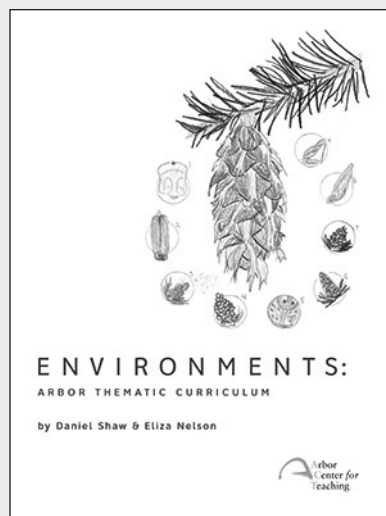
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NOW AVAILABLE FROM ACT



The Arbor Center for Teaching has recently published a guide to Arbor's Environments curriculum for fourth and fifth grade. This first volume in the Arbor Thematic Curriculum series is a resource for teaching big ideas about niches, habitats, world biomes, geography, oceanography, and the human body. Relevant Cambium back issues are included. Thanks to support from the Gray Family Foundation, we will hold a 2015 summer workshop on teaching from the Environments guide. For more information, visit our website: arborcenterforteaching.org.



ARBOR SCHOOL
OF ARTS & SCIENCES

FROM HOMER TO THE COWBOYS

THE CASE FOR RECITATION & LONG LISTENING

by Kit Abel Hawkins & Laura Frizzell

“Sing in me, Muse, and through me tell the story
of that man skilled in all ways of contending,
the wanderer, harried for years on end,
after he plundered the stronghold
on the proud height of Troy.”

—*The Odyssey*, translated by Robert Fitzgerald

The words of this epic tale form a critical part of the treasure that Arbor students carry with them. Students have not merely read this delicious language as fourth and fifth graders but have heard it (first in the context of the Primary play “The Golden Apple,” chronicling the start of the Trojan War), drawn and mapped it, imagined it and retold it, and taken large sections of it into memory, reciting their portions repeatedly in preparation for a performance for our community. Students call upon the Muse themselves, and backed by their peers operating giant puppets and monstrous props, words that have come to us over three millennia continue to engage and nourish.

Part of human thriving is gathering up knowledge for a richly stocked mental library full of memorable language, stories, poems, songs, fables, riddles, and rhymes to augment our supply of practical facts and operations. Our frequent rendering in Assembly of “The Cat Came Back” is ample demonstration that not all of what our students absorb is as freighted with history as is *The Odyssey*. The ridiculous, the improbable, the lyrical, and the wise fill varying elements of our curriculum and community culture. Shot through it all, however, is our obvious commitment to children’s memorizing and performing — solo, in choric style, in Shakespearean plays, around campfires, at the end of the Oregon Trail, and at every community gathering.

Why expend so much time and energy in the old-fashioned pursuit of memorizing poetry and song? Such a stance might be criticized as antediluvian, a throwback to the schooling of a hundred years ago. Recitation has certainly all but vanished from American curricula. In an age when oral tradition has been supplanted by written records and now the vast global storehouse of the internet, why work to build children’s capacity for memory and spoken performance?

Speech is prized at Arbor, especially as evidence of understanding. Teachers urge even those who might prefer quiet to voice their thoughts, to perform, to recite, just as every child at the school, no matter his proclivities, is asked to make music and to draw and build. To teach the art of the spoken word is to elevate the diction and clarity



Intermediates of yesteryear with a giant Cyclops puppet

of the content of student speech, to promote the arts of discussion and conversation, to build skills for advancing an argument or explaining one’s thinking. Eloquence will serve our students well whatever their course in life.

Memorizing poetry makes us vessels to carry forward some of the best of human expression. *The Odyssey* was probably an oral tradition before Homer wrote it down, and its richness of language and plot has placed it at the pinnacle of the Western canon for generation after generation since. It is a cultural heirloom we are privileged to pass down to the minds and mouths of those who follow us. And less exalted texts are worthy of preservation and enjoyment, too. Folk songs like “Fifteen Miles on the Erie Canal” teach us about slivers of our history, paint a picture of human experience, and endure because they’re soulful and satisfying to sing in community.

Singing together, speaking in unison or in turns — these acts require an equally essential complementary skill. We must listen. This is an era in which listening seems to be prized. But often we are listening not to one another or a common strain but each to her own soundtrack — via iPod, bluetooth, smartphone, with those ubiquitous earbuds. What we aim to teach at Arbor is responsive, active listening, the kind of listening that precedes thoughtful critique, joining in with a harmony, or expressing warm appreciation.

What does it look like when Arbor students are listening, memorizing, reciting, and singing? No one knows better than Laura Frizzell, who is much more than a music teacher. She is our bard. Here she shares her thoughts about the value of weaving these skills into the elementary curriculum through teaching ballads and epic poetry.

–*Kit Abel Hawkins*

THX. XOXO. BCNU.

The meaning of the old adage “less is more” has stretched to include the ways we communicate with one another electronically. Acronyms, like those above, are part of the “hurry-up” expectations we have of our devices, and even of the people who text and e-mail us. And yet, we relish the “long listen.” Certainly, the advent of recorded books has done just that for travelers. Portland to Seattle? Scoot over, people; we’re taking a murderess along. In the space of three hours, Agatha Christie has killed off the butler, the governess, the doctor and more, and before you know it: there’s the Space Needle! Time and miles miles fly by in the grip of a master storyteller.

Indeed, the slow savor of literature is very much with us in today’s society, during car rides and, more importantly, in our classrooms. An aim at Arbor is to involve children not only as an audience for the long listen, but to encourage their voices as presenters of music, plays, storytelling, and poetry. We place a high value on the virtues of tackling the epic story, the substantial poem, and the winding ballad.

Our weekly assemblies include singing together from our Arbor songbook. Amidst the requests for “Mango Walk” and “Deep River Blues,” we frequently make time to settle in for six-, eight-, even twelve-verse ballads — beyond “The Cat Came Back,” we often sing “Charlie on the MTA” and “The Golden Vanity,” to name but a few. Older students help younger buddies navigate the lyrics on the page; little by little, the silly, surprising, and poignant stories in these ballads start to sink into collective memory. Homeroom teachers make an effort to practice these songs with their classes for assemblies, a great boon to the singing culture here at Arbor. And those songs anchor deeply. An Arbor family once took a rafting trip, parents in a boat ahead and their girls paddling as a trio behind. The children’s boat capsized and the parents floated ahead unaware for fifteen minutes. As they hurriedly made land and raced anxiously back upstream, they were guided to the sopping but unharmed girls’ location by the strains of lusty singing of the Arbor Songbook!

Along with all-school sings, individual classes often have the task of learning and arranging a poem for performances. Tackling a poem, story, or song over time with a class exercises the “muscles” of memorization, cooperation, and creativity. It’s rare that a child knows only his or her own part; the whole effort is quite democratic. Students decide together which lines should be solo, which spoken in a group, and they consider volume, inflection, gesture, and more.

Recently, the ballad “Them Stars,” composed by Margaret MacArthur from Arthur Guiterman’s poem “The Star Planters,” was just this kind of project for our fourth and fifth graders. Their homeroom study of constellations sparked a search for songs about the stars. We’d already enjoyed years of singing “The Galaxy Song,” a Monty Python favorite brought to Arbor by Intermediate teacher Charles Brod. So, what’s another fifty-six lines to learn, especially when it’s a rollicking cowboy ballad, by gum? From Coyote — “a scalawag all the way through” — to the Big Chief Citola, the colorful language and MacArthur’s wonderful melody fueled us onward for weeks. Finally, around a “campfire” of flashlights, the Intermediates performed “Them Stars” to their classmates’ accompaniment on guitar, mandolin, ukulele, and cello.

Memorization of “Them Stars” paved the way for the Intermediates’ Winter Solstice performance of *The Odyssey*. There are direct parallels to be drawn between cowboy poetry and Greek epics — tales of heroes and scoundrels, perils and tragedies, gumption and fate, long-arching colorful narratives drawn out and embellished around the fire. Beyond soaking in a form of storytelling that has appealed to humans since the dawn of civilization, the Intermediates got to practice committing a large number of lines to memory with the scaffold of a tune before forging on alone with Homer. Music helps words lodge more firmly in our minds, which is why we sing the ABC’s (in Greek, too, if you’re an Arbor Primary!), the three-times table, and even the periodic table later on.

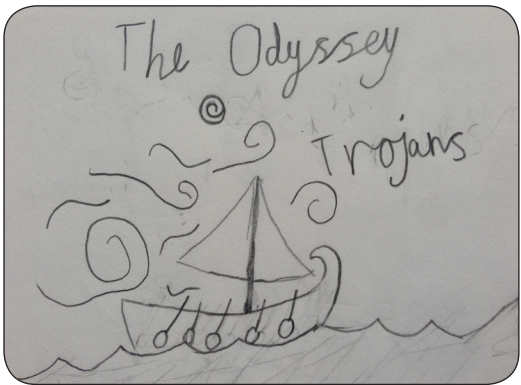
The children are steeped in “working the word” in all sorts of ways at Arbor. Soon, it will be someone else’s turn to recite Seamus Heaney and William Butler Yeats at our Irish Ceili, present a retelling of the Ramayana at our Diwali celebration, voice the tragedy of Narcissus and Echo through a Greek chorus, or stand in front of an audience with an original poem, piece of writing, or song. We’re in it, for the short — and long — listen!

—*Laura Frizzell*

HIGH HEARTS & HERO TALES

INTERMEDIATES PERFORM *THE ODYSSEY*

by Sarah Pope, ACT editor, & Becca Blaney, grade 4-5



What makes a story endure for thousands of years? In a curriculum year dedicated largely to the history of human knowledge, the Intermediates revel in great hero tales with timeless themes and lustrous language, still gripping as ever. Bloody battles, wily tricks, great friendships, betrayals and bacchanals, monsters and gods, sacrifice and perseverance — even shrouded in unfamiliar poetic language, these plots and characters are irresistible.

And Intermediates are old enough both to

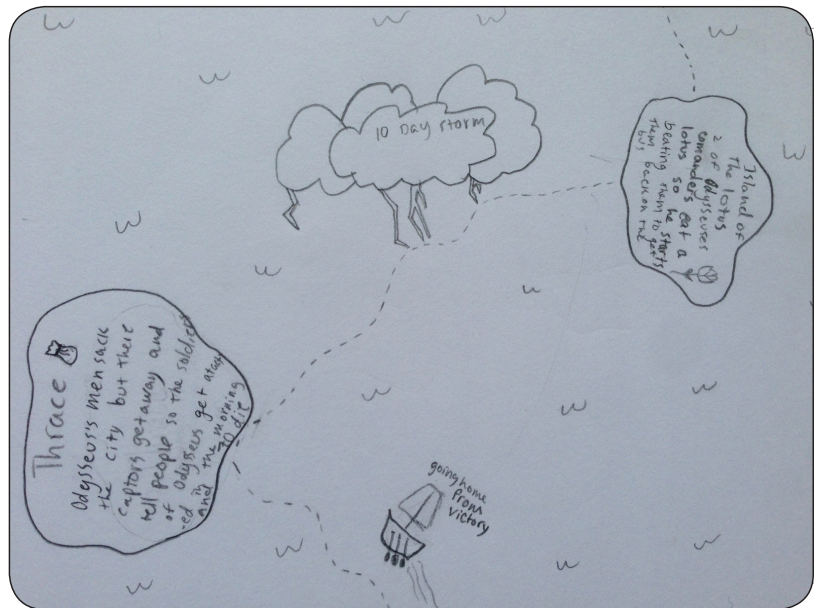
savor a colorful turn of phrase and to puzzle out the meaning of a novel word, all the while storing up ideas for their own writing.

We first introduce *Gilgamesh*. This oldest of stories is also meat for Arbor Seniors in their Humanities studies of the rise of civilizations. At the Intermediate level, it's a natural extension of our investigation of the origins of writing. We read it aloud while the students sketch impressions in their journals, pausing often to discuss mercy, friendship, forgiveness, overcoming difficulties and evil, humans' desire for immortality, and our relationship with the divine. This year, each student chose a prominent scene to illustrate more completely on a poster.

Gilgamesh prepares the ground for an encounter with Homer's *Odyssey*. This epic is an engaging access point into ancient Greek civilization, which we study in depth for its contributions to mathematics, science, political philosophy, art, and architecture. Memorizing some portion of Homer's poem has been a hallmark of the Intermediate experience since Arbor's earliest years.

The manner in which students engage with *The Odyssey* varies from year to year; recitation is a constant, but often we have given students the option to choose between performing a scene and illustrating a portion of the story as a graphic novel. This year, having a group with an especially dramatic bent and already having deployed pen and paper for a culminating project in our *Gilgamesh* unit, we decided everyone would perform. The Intermediate segment of our Winter Solstice evening would be given over to three scenes from *The Odyssey*.

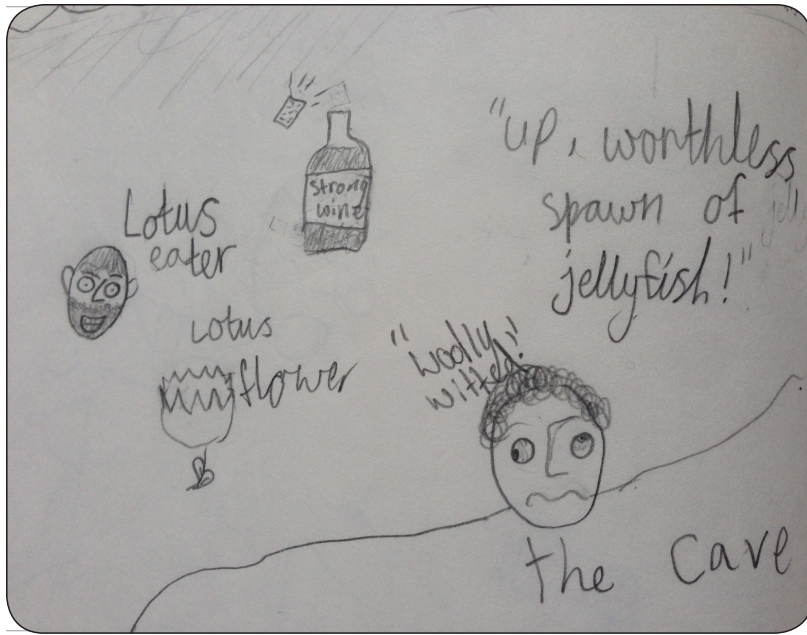
Again we began by letting the students soak up the language aurally, reading aloud Rosemary Sutcliff's retelling, *The Wanderings of Odysseus*. Each morning over several weeks we dipped into that engaging, well illustrated, sensitively abbreviated version of the epic. As the children listened, they recorded key events in their sketchbooks through some note-taking and countless drawings. Some chose to make a map of the hero's journey homeward, others recorded what they heard in graphic panels. The choice was theirs. They also jotted down



Intermediate students may remember Odysseus from read-alouds in their Primary Journeys year, and fondly remember performing in "The Golden Apple," a beloved student-authored play that tells of the events precipitating the Trojan War. See "What Could Be Wong With Such Wuv?" in Cambium Volume 2, Number 3, "Arts As Core Content."

Back issues of Cambium are available for free download on our website: arborcenterforteaching.org.

A detail from Ruby's multi-page map of Odysseus's journey home to Ithaca



Greta's journal record of some inventive language from the *Land of the Lotus Eaters*

particularly poetic phrases they noticed, brief summaries, and the names of ancient Greek places and characters. As with *Gilgamesh*, we paused often to tease out meaning or discuss questions that arose. By Winter Break, all the students grasped the rough shape of the story and knew its outcome.

When we returned from vacation, the teachers revealed the three scenes we would perform for our Winter Solstice celebration: the Cyclops, the Lord of the Winds, and the Sea Perils. The students chose which scene to perform in and quickly began to collaborate on the staging. We had limitations to contend with — everyone would be on stage the whole time, so there was no opportunity for costume changes, and we had time to build only the most essential props and sets. Each group would have a rotating narrator while everyone else performed the scene.

Every child was assigned the relevant portion of Robert Fitzgerald's translation to memorize. In a related homework assignment, they were asked to retell that scene in their own modern language, looking up unusual vocabulary and making sure the emotional content was fully preserved. Here is Levi's interpretation of Nobody tricking the Cyclops:

I was ready to do my plan. I walked to the cyclops and said, "Hey Polyphemus, wanna get drunk?" He said, "Sure, I could drink," and he grabbed the bowl I was holding and drunk it all and I had to refill it three times until he got drunk. When he did I said, "Hey wanna know my name well I'll tell you anyway, it's Nobody." Cyclops said, "Well I'll let you watch me eat all your friends first and then do the same to you. That's a good deal right?"

Each group made its own decisions about how to apportion lines for the performance, with one group changing narrators line by line and the other two breaking their scenes into longer passages for each narrator. We had only about a week's time before an all-school performance, so we launched straight into daily read-throughs and blocking sessions. We coached students on enunciation, what to emphasize, where to pause. We talked about how recitation is not normal speech — a favorite Arbor watchword to improve delivery on stage is "slouder:" slower and louder. The children were required to think about the emotional impact of particular lines or words; we wanted to avoid any tendency to memorize and then recite mechanically, without attending to meaning.

The students practiced sound effects, too, collaboratively arranging instruments to bring waves and winds to life. They created percussion "sound carpets" to enhance the delivery of the lines; our limited time prevented the addition of pitched instruments in this instance, but similar performances at Arbor often involve student compositions on recorder and tone bars, too.

Props took rapid shape in the Design studio, with extra assistance from a few crafty parents. The kids turned back to their journal sketches to find models for a giant cardboard cyclops, a six-headed Scylla beast, and inspiration for the performance of whirlpools and winds. They did a bit of historical research to design a creditable oared galley. We went for scale and impact and speed, shaping our monsters and ships with cardboard, wadded paper, duct tape, and spray paint. We kept the costumes simple, too, performing in simple *chitons* with black clothing beneath. Our one theatrical

The Doric chiton was a simple, sleeveless, rectangular garment draped and fastened at the shoulders with pins, sewing, or buttons.

extravagance: a raw egg for the Cyclops's eyeball, scrambled and dyed with red food coloring and contained within a yogurt cup and plastic wrap until punctured on stage by Odysseus's spear — to the delighted revulsion of the audience.



Cyclops as classroom decoration, perched atop the supply cabinet

We closed our Ancient Greece unit and celebrated our successful performance with a Greek feast, using drinking vessels made in Design class from clay and decorated with images of gods and revelers.



At left, a kylix vessel adorned with an image of Athena and her owl. At right, Sawyer drinks from his kylix at our Greek feast.

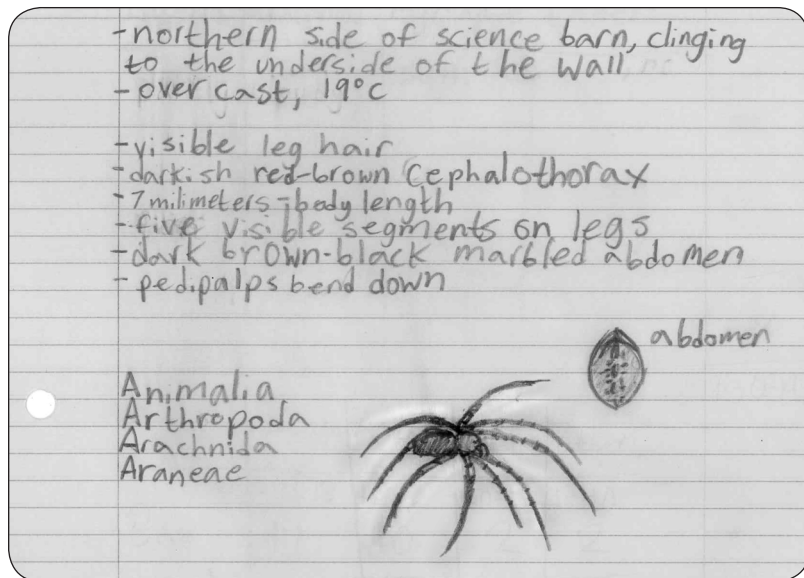
DIVERSITY IN THE DETAILS

ARTISTRY IN SUPPORT OF SCIENCE

by Greg Neps, grade 6-8

For centuries before the invention of the camera, natural scientists relied on minutely detailed and beautiful drawings to understand and communicate about the known world and its contents. Accuracy in rendering the parts and proportions of plant or animal specimens could make the difference in recognizing new species or better understanding a creature's life processes and place within its ecological niche. Being able to draw what you see remains an important foundational skill in the sciences as well as in the arts, and it is an ability that we seek to develop across the curriculum at Arbor School.

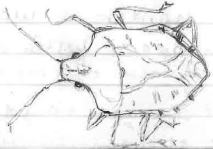

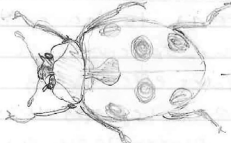
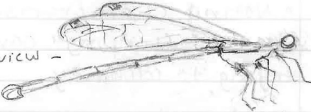
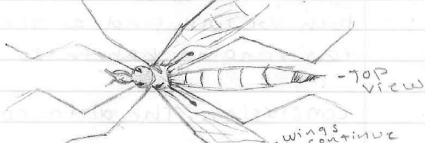
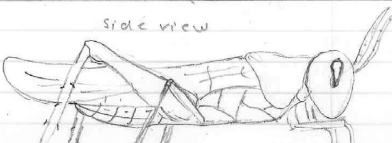
Noticing and recording are always at the heart of Senior (6-8) Science. Last fall, careful technical drawings and attention to the minute details of invertebrates allowed students to engage with, examine more closely, and accurately identify over fifteen families of insects, eight orders of arachnids, and a vast diversity of aquatic invertebrates found on Arbor's campus and in its creeks and ponds. Through careful inspection and regular practice at illustrating what they saw, students refined the confidence and critical eye necessary to accurately portray their specimens in their lab notebooks. By steadily increasing the level of detail required in the illustrations, and by drawing attention in class to specific anatomical structures, we led students to a measure of skill that allowed them, with increasing regularity, to identify their insect and arachnid specimens to the species level.



Eliana's notebook entry on a spider specimen

Our study of invertebrates began with live insects we collected during class times. First cataloging location, temperature, weather, and other condition details, the students then employed nets, aspirators, beater sheets, and collection vials to capture their specimens. During these initial forays, the students were asked to record their data and to simply sketch their specimens. Many of these illustrations were quite crude and often reflected only a rudimentary understanding of insect body plans — three sections, six legs, and a pair of antennae. Many of these early-fall specimens were members of the order Hymenoptera — bees, wasps, and ants. Bringing these insects back to class, many students referred to them as yellow jackets or bumblebees — common names that were sometimes accurate. But students lacked the knowledge of distinguishing

details to support their conjectures. Using a document camera to project large, high-resolution images of our specimens, we could carefully inspect, compare, and catalog distinguishing features to help us identify them and make better guesses about future captures. Drawing attention to the membranous wings, distinct coloration patterns, and “Victorian-style waists” of Hymenoptera helped students begin to more accurately differentiate this order from others and improved their illustrations of those insects they collected.

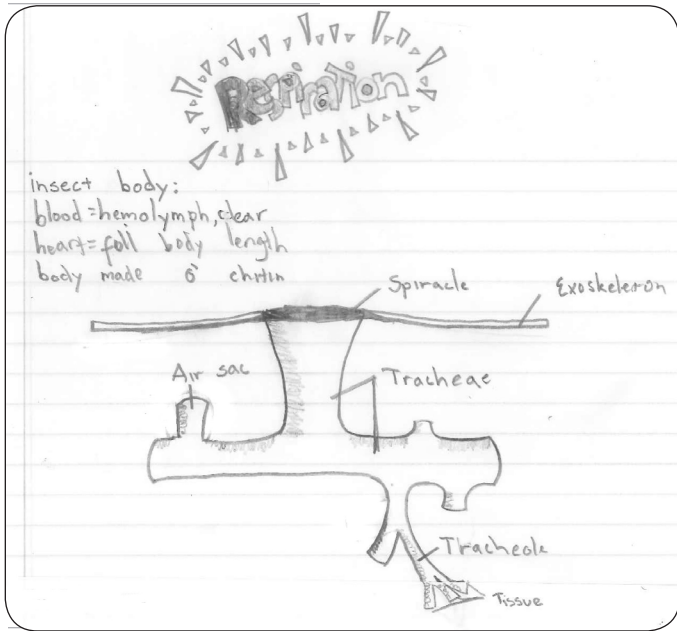
Family Species Name	Illustration of Species
① halys	 <p>- Top view Note: This Arthropod is a danger to Oregon crops.</p>
② diadematus	 <p>Top view -</p>
③ septempunctata	 <p>- Top view</p>
④ irene	 <p>side view -</p>
⑤ tipulidac	 <p>- top view wings continue</p>
⑥ Acrididac	 <p>side view</p>
<p>Note: Illustrations above are not to size or in color.</p>	

Ella's log of various species captured on the Arbor campus

After netting several Odonata (dragon and damselflies), students found that one of the critical features for proper identification was the intricate wing-venation patterns. Scrutinizing the loops, cross veins, triangles, stigma, and nodi of these delicate structures, students carefully recorded the networks of veins in their lab notebooks. Using those illustrations, Seniors could soon make positive identifications of the skimmers and clubtails residing on our campus. Making the lab notebooks both record and resource was an explicit goal of these activities.

Such careful scrutiny was also critical in our identification of an invasive that has taken hold in the Northwest. While stinkbugs are readily identified and were easily classified by students as members of the order Hemiptera by the X-shaped pattern on their back made by the “half wing covers,” only careful examination of the banding on the edges of the partially shielded back let us confirm that the invasive brown marmorated stink bug had taken up residence on our campus.

Emilio's diagram of the invertebrate tracheole respiratory system. Below, Adlai illustrates a crayfish during our dissection exercises.



Although field guides indicated it wasn't the right season for crayfish reproduction, we had to release all but two of our female specimens because they had clutches of eggs. We also discovered our creek is home to a population of larval-stage Pacific lamprey, a threatened species of cultural and historical significance to native peoples in our area. Unexpected results in science are often the most important!

Arbor Seniors are used to examining Latin and Greek roots in their literacy studies; knowledge of those roots is a great help in understanding and remembering scientific nomenclature.

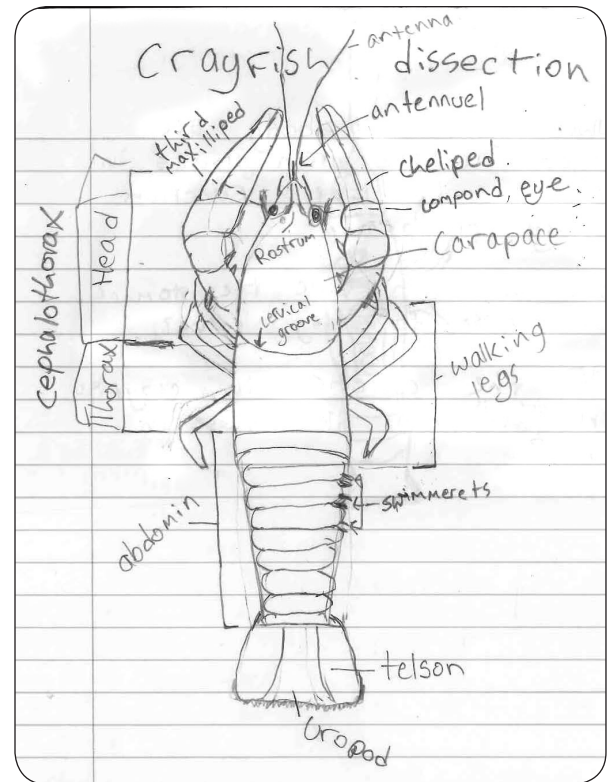
One of the most readily identifiable insects for our Seniors was the ladybug. While the familiar common name enabled most students to find this category of insects in our field guides, they were overwhelmed by the number of Coleoptera that look like the common ladybug. The Seniors were driven to count spots, examine coloration, reference territorial ranges, and inspect the degree of the head's extension beyond its hard shell in order to make a more accurate identification.

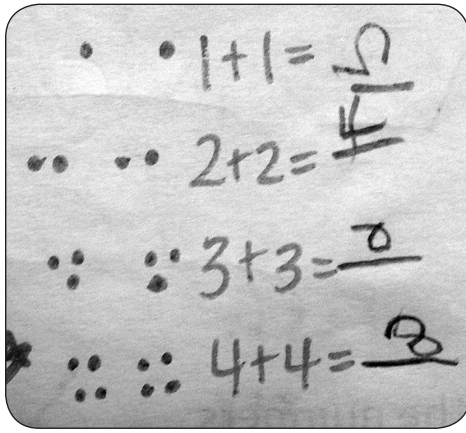
Grasshoppers were our vehicle to examine the tracheole respiratory system and the open circulatory system of insects. These large and plentiful specimens abound in the fall and are a joy to chase after with net or jar. Using microscopes and hand lenses, students examined the jointed legs for which arthropods are named, illustrated the joints in their notebooks, and searched for the holes (spiracles) on the sides of the insect's abdomen through which it breathes. This led naturally to lessons comparing the gills of crayfish, the tracheole systems of insects, and the book lungs of spiders, while always referring back to the human anatomy the students are most familiar with.

We dissected crayfish caught in our creek, examining and carefully documenting the organs and structures of the nervous, circulatory, digestive, and respiratory systems. Working carefully, the Seniors were able to identify these structures and to examine external copulatory organs and internal reproductive structures to determine the sex of their specimens. The opportunity to work with specimens

caught in our own backyard and to use their knowledge to identify native and non-native populations heightened our students' ownership of this project and their sense of stewardship for the creatures that share their campus.

As the students honed their skills as collectors and naturalists, they also gained greater understanding of the logic that governs the ordering and classification of the animal kingdom. They learned to use dichotomous keys that depend on observation of distinct body structures, which led them to a greater understanding of the taxonomical hierarchy of all living things. While the devil resides in the details, so too do joy and understanding. Through careful examination of the details of our resident invertebrates, Arbor students develop greater appreciation, stewardship, and understanding of the species with whom they share their world. By illustrating what they observe, they hone and broaden their abilities to accurately describe that world.



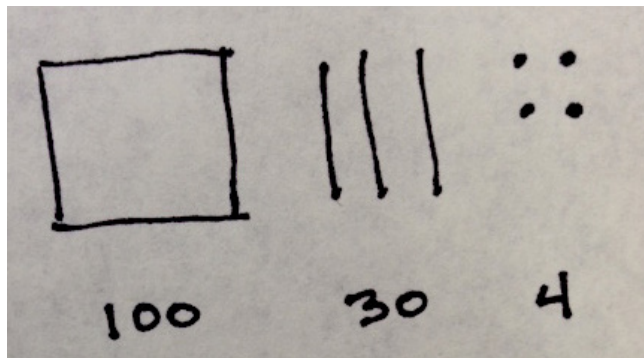
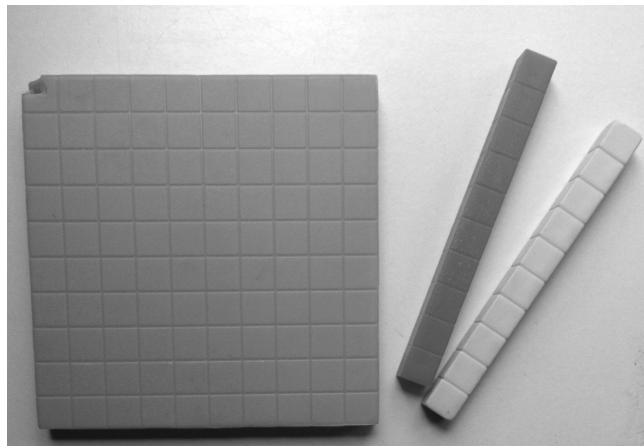


An Arbor-style rekenrek can be easily built with wood scraps, small dowels, plastic beads, a hand drill, and wood glue. Two larger-gauge dowels at the top provide stability.

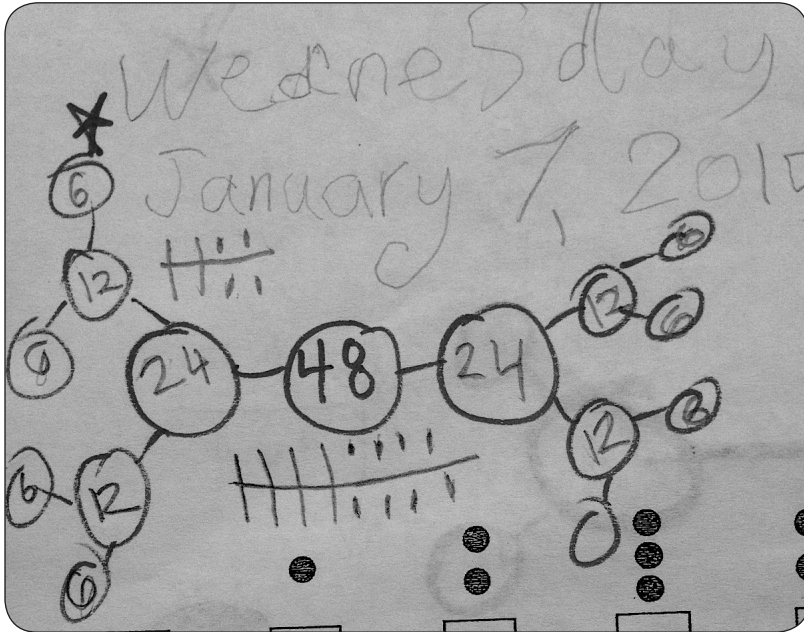
As Bella's work shows here, directly representing simple objects like beans is more efficient... as long as there aren't too many beans involved in the equation. But Primaries need manageable tools that can bring operations with larger numbers within their grasp.

In eighteen years of teaching math to K-1 students, Lori Pressman has amassed an excellent collection of manipulatives, including a Dutch abacus-style calculator called a *rekenrek*. Sliding its simple red and white beads from one side to the other, her students can easily work simple addition and subtraction problems: $8 + 5$ is rendered as two groups of five white beads plus three red ones, so children can both count up the sum of 13 and increase their understanding of place value: 10 whites, 3 reds. (Junior teacher Peter ffitch adapted the original model to add a third bar to Arbor rekenreks so that children could more easily visualize division by 3 and add numbers up to 30.) But children still had difficulty bridging from the concrete representation of beads on the rekenrek to the abstraction of numbers.

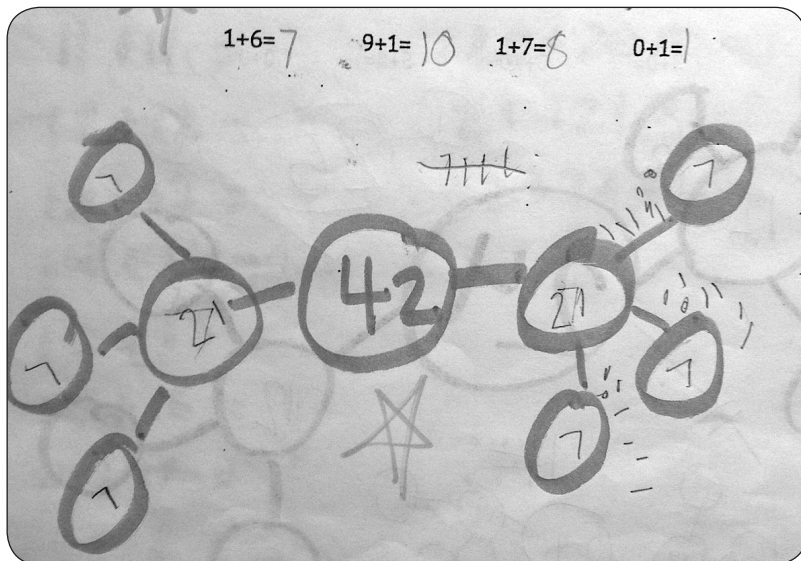
A visual representation was needed to help students connect the physical world with the symbolic world. The simple and efficient solution Lori has developed in the past few years translates the familiar hundreds' squares, tens' rods, and ones' cubes into simple visual expressions that help Primaries accomplish multi-digit addition and subtraction:



This system also allows children to easily assess the results of dividing a number into two equal parts, for instance. The Primaries call this “cookie math.”



Above, Lucie begins with a plate of 48 cookies. She decomposes the number into 4 tens and 8 units. Drawing a line horizontally through her picture lets her count four sets of 5 (20) and 4 units above and below. She is able to further divide 24 into two 12's, and so on. The beauty of cookie math is its efficiency and handiness; it does the work of manipulatives without requiring the objects themselves.



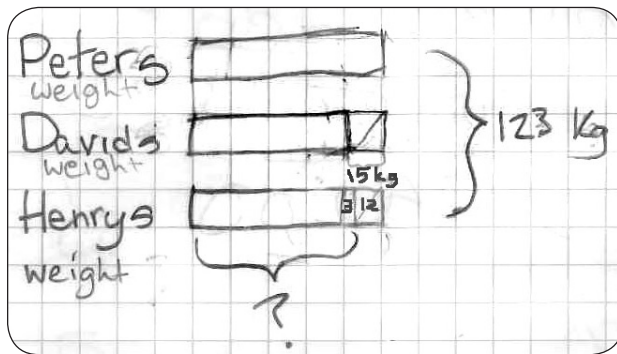
Here Sofia breaks down 42, first by 2's, but then encounters a number that can't be divided in two with the horizontal line. Few Primary-age students are equipped to start guessing and checking other possible divisors, so at this point Lori assists Sofia by drawing three smaller plates. Sofia is able to use the rekenrek to discover that three groups of 7 will sum to 21 and adds those “cookies” to her drawing.

Three-digit numbers can be tackled with visual representation, too: a square stands in for 100, representing the trusty orange hundreds' square. As students mature in their number sense, they see how to regroup hundreds into tens and tens into units, and all the while they are soaking up practice at decomposing numbers and skip-counting by

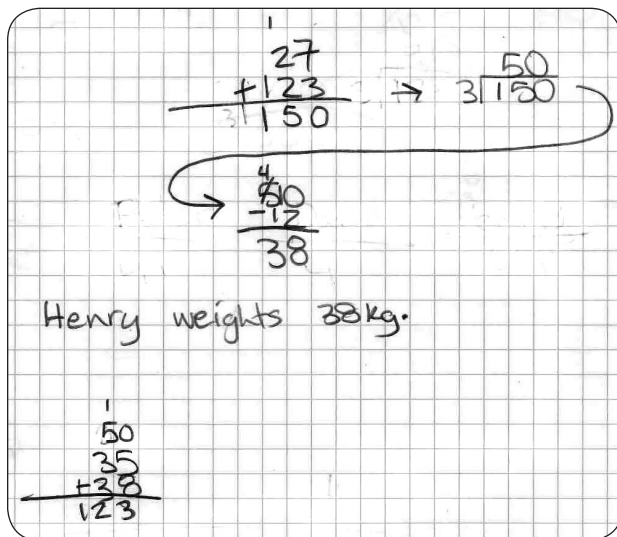
2's, 3's, 5's, and 10's through a hearty stew of classroom activities. Each day brings mathematical songs and games and a hundreds' chart that slowly fills with color-coded numbers — red for -3's, green for -5's, white for -0's, etc. — until we reach the 100th day of school. “What if I need to count to 90 but I'm so tired I only have three numbers left in me?” Lori asks her students as they cluster around the math calendar on this 90th day of school. They puzzle out how to count by 30's, tipping the cards for 30, 60, and 90 on point in the hundreds' chart so everyone can see the pattern. “It's like skip-counting by 3's!” Levi recognizes, examining the tens' digits.

At Arbor we believe it is important to help children develop the capacity to work in the abstract realm of numbers, but not necessarily to privilege calculations done purely with numbers over those supported by visual or concrete expression. We do not want students to see manipulatives and drawings as juvenile crutches to be outgrown; we want them to develop the flexibility to work with a variety of strategies and judge for themselves which approach will be most efficient or most illuminating in each new problem-solving situation. These Primaries will find that cookie math can serve them for years to come, whether as a first approach to solving an equation or as a useful check for accuracy. As fourth and fifth graders they will do extensive algebraic operations using an elegant visual expression called the bar method, taken from the Singapore Ministry of Education's Primary Mathematics textbooks. Here is an example:

“The total weight of Peter, David and Henry is 123 kg. Peter is 15 kg heavier than David. David is 3 kg lighter than Henry. Find Henry's weight.”



Berit begins by drawing three equal bars representing the boys' weights and marks off the known differences: David + 15 equals Peter; David + 3 = Henry, plus another 12 = Peter.



Then she adds 12 and 15 to find the total needed to bring all the boys up to equal weights. She adds this 27 kg to the given 123 kg total weight, then divides the resulting 150 by 3 to find Peter's weight. Henry weighs 12 kg less, so his weight is 38 kg. Berit now knows all three weights (David = Peter's 50 kg - 15, so 35 kg) and sums them to 123 kg to check her work.

Visual representations are equally vital tools at the Senior level (grade 6-8). As our students study algebra, drawings will help them make sense of everything from functions to distance-rate-time problems, from the coordinate plane to the conic sections.

Distance, rate, and time problems

Owen paddled his boat downstream and back over the course of 4 hours, he can paddle at 5 miles per hour. On the way back upstream he can only paddle 3 miles per hour. How long did he spend paddling downstream?

first make a little chart like this:

	Downstream	Upstream
Time	x	$4-x$
distance	$5x$	$(4-x)3$
rate	5	3

Then find which (T, D, or R) are equal. In this case it's Distance.

$$5x = (4-x)3$$

Now simplify:

$$5x = (4-x)3$$

$$5x = 12 - 3x$$

$$8x = 12$$

$$x = 1.5$$

now copy your chart out again:

	Downstream	Upstream
T	1.5	2.5
D	7.5	7.5
R	5	3

Mira's Note to Self (a summative exercise expressing understanding of each chapter's new material in our Arbor Algebra series) employs charts to clearly lay out the relationships between distance, rate, and time. Mira's work here captures her personal strategy for solving problems of this type; note that she prefers to lay out both the problem and her answer in chart form.

THE GREAT MIGRATION

TEACHING HISTORY THROUGH ARTS & LETTERS

by Cara VanGorder-Lasof, grade 6-8

I am a Pacific Northwesterner, through and through. I've spent more time in other countries than I have in other regions of the United States. But in teaching American history, I've developed deep curiosity about events that have unfolded far from the area I call home. And so, when perusing the National Endowment for the Humanities Summer Institute offerings for teachers in 2012, I was immediately struck by a seminar that was being offered in Columbia, South Carolina to teach participants about literary and artistic responses to the Great Migration. I had never heard the term "Great Migration" before, yet I'd been teaching about migration and immigration for over fifteen years. I applied immediately. This mass exodus of millions of African-Americans from the rural South to the urban North from approximately 1890 until 1970 isn't typical content for middle-grade Humanities programs, but I sensed it would quickly find a place in the Americas curriculum I was about to teach.

In the sweltering heat of July, I arrived in South Carolina. Prior to arriving, all Seminar participants had been asked to read Isabel Wilkerson's *The Warmth of Other Suns*. The book tells the story of the Great Migration through the lives of three people Wilkerson spent countless hours interviewing; she masterfully weaves their experiences into the broader historical context. This book set the stage for two weeks of intensive study of the music, art, literature, and events that unfolded due to the Great Migration. A trip to the town of Cheraw further personalized that history for us, as we had the opportunity to meet and interview members of that community who had taken part in the Great Migration and had eventually chosen to return to the South. Wilkerson's stories and those of the people I talked to in Cheraw gave me an unforgettable window into how this mass migration affected real people's lives. One of my primary goals as a teacher of history is that students learn why past events matter by reading about, writing about, and imagining how people were impacted by those events.

I returned to Oregon eager to teach about the Great Migration in my own classroom. The most significant challenge was to figure out how to incorporate even a fraction of what I'd learned into an already full year. My teaching partner and I planned that I would follow our study of the Civil War and Reconstruction with a week of Great Migration lessons. This series consisted of three main parts: introductory activities, expert group work with primary sources, and a design-based assessment.

<u>Push factors</u>	<u>Pull factors</u>	<u>Questions</u>
<ul style="list-style-type: none">• prejudice & discrimination• violence as result of prejudice• less opportunities• Jim Crow laws (1880s-1960s)	<ul style="list-style-type: none">• heard about cities or read of them in mail-order catalogues• higher wages• "receiving station & port of refuge"	<ul style="list-style-type: none">• Did the Southern whites want the African Americans to leave & go to the North, or did they oppose it because the act of leaving showed their freedom?• Why didn't the Great Migration begin sooner?

Katie's chart of push and pull factors in the migration

Introduction to the Great Migration

I decided that the best place for my students to start was where I'd begun, with Isabel Wilkerson's work. After reading an excerpt from *The Warmth of Other Suns* that gave an overview of the Great Migration, my students applied their knowledge of push and pull factors that drive immigration. We worked as a whole group to identify what the text revealed about factors in the mass exodus from the South.

After writing about and discussing the primary push and pull factors, students were ready to experience Jacob Lawrence's Migration Series, a series that consists of 30 panels about

life in the South and another 30 about immigrant experiences in the North. The Phillips Collection in Washington D.C. has half the panels in their collection and has published

a teaching kit on Lawrence’s art and the Great Migration that is an incredible resource. These paintings, along with Wilkerson’s book, had provided the foundation for my seminar work in South Carolina. I was confident that my sixth-eighth graders would be intrigued by Lawrence’s work and interested in uncovering the messages he might be sending about the Great Migration through his paintings.

Before projecting some of the panels, I gave the class a brief introduction to Jacob Lawrence and the Migration Series. The first time through the paintings, I wanted students to simply take them in and imagine how each piece might be connected to this migration story we had begun to study. During a second viewing, students wrote detailed observations about what they noticed in terms of the lines, shapes, colors, and patterns in the paintings. After several students shared their thoughts, we discussed their inferences about the meaning of the panels. I had hoped that Jacob Lawrence’s work would capture students’ interest and cultivate curiosity about the Great Migration, and Lawrence did not let me down. Not only did students emerge from this “art look” with detailed observations and inferences, they were now bursting with questions about this episode in American history. Students’ wonderings ranged from wanting to know whether the North met the migrants’ expectations to questioning how a mass movement out of the South would have impacted those left behind. *Why didn’t the Great Migration begin sooner? How did people in the North respond to the influx of African-Americans?* Throughout this unit, students discussed whether they would have made the choice to stay or leave, practicing perspective-taking as well as evaluative thinking.

Expert Groups Activity: Great Migration Primary Sources

I have always loved using primary sources in class due to the engagement they generate, the rich information they convey, and the opportunity they provide for students to practice analytical skills. Given the wealth of primary source material I’d brought home from the NEH seminar — photographs, music, poetry, maps, letters, and political cartoons from before, during, and after the migration — I decided to create an Expert Groups activity. Students working in small groups would immerse themselves in a sub-collection of primary sources and then use those artifacts to teach the rest of the class about one phase of the Great Migration.

I created seven folders full of primary sources, three of which addressed life in the South and some of the most important push factors, three folders about the journey from the rural South to the urban North, and one folder with primary sources about life in the North.

One of the folders about the migration phase, for example, contained “One Way Ticket” by Langston Hughes, an advertisement for employment placed in an African-American newspaper in Chicago, and the lyrics to W. C. Handy’s “St. Louis Blues.” I also made a Bessie Smith recording of this song available for this group to listen to and use in their presentation.

Each group of three to four students received their folder of four to six sources and document analysis worksheets with the following instructions:

Part One: Primary Source Analysis

Examine the contents of your group’s folder individually. Once everyone has had some time to see and read everything, begin to discuss what you notice.

Analyze: Use the document analysis handouts to help your group do an in-depth analysis of three of your group’s documents. Discuss your ideas and make sure everyone’s voice is heard.

Infer: Based on what you have observed and analyzed, create a list of what your group believes to be the most important things your documents show about your topic (Life in the South, Migration, or Life in the North).

The idea that people are pushed from a place by hardship or pulled toward a place by perceived benefits is not new to Arbor Seniors. They have talked about human migrations in these terms since the earliest grades. Most recently, this cohort had studied how push and pull factors affected immigration from Europe to North America in the late 19th and 20th centuries.

View Lawrence’s Great Migration panels online at www.phillipscollection.org/migration_series/.

The emphasis of the Phillips curriculum is on the migration itself, not on the lives of the migrants afterward; hence the imbalance in primary sources.

I used primary document worksheets available on the National Archives and Records Administration website: www.archives.gov/education/lessons/. These handouts are specific to the type of primary source you are asking students to analyze and are wonderful tools that help them to consider the many layers of meaning a source may contain.

PHOTO ANALYSIS WORKSHEET

Step 1. Observation

A. Study the photograph for 2 minutes. Form an overall impression of the photograph and then examine individual items. Next, divide the photo into quadrants and study each section to see what new details become visible.

B. Use the chart below to list people, objects, and activities in the photograph.

People	Objects	Activities
people on bridge	house	
	factory	
	bridge	
	cars	
	run-down house	

Step 2. Inference

Based on what you have observed above, list three things you might infer from this photograph.

- the bridge is a divider between the nice and more run-down areas
- people who live in the houses probably work in the factories
- the closer house looks more like an apartment building

Step 3. Questions

A. What questions does this photograph raise in your mind?

- What kind of people lived in this area of town?
- What kind of factory was it?
- How was this town different or similar to something you might have found in the south?

B. Where could you find answers to them?

- Letters, photographs, church records
- Tax records
- Compare to maps/photographs/church records of the south

Designed and developed by the
Education Staff, National Archives and Records Administration,
Washington, DC 20408

After groups completed these steps, it was time to plan their ten-minute presentation.

Part Two: Presentation Planning

Your presentation needs to contain:

- a "hook," or effective way of engaging the interest of the audience
- showing of three primary sources in your folder (see further explanation below)
- conclusion: possibilities include telling us what you learned about your topic, why knowing this matters, or ending with several interesting questions that will help the audience reflect on what you've shared

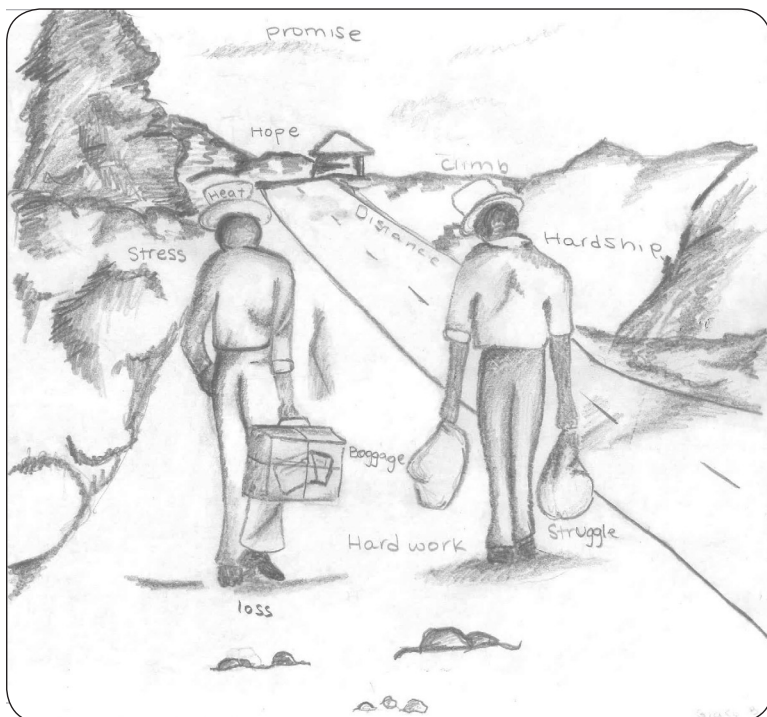
For each source you share, please do the following:

- Point out several specific details in the source that your group noticed when discussing and analyzing the source.
- Consider engaging the audience by preparing one or two questions to ask them about the document.
- Explain what the document tells us about your phase of the Great Migration, sharing your group's specific inferences.

After two 50-minute class periods working with the primary sources, we took another full class period for presentation

planning. The room buzzed with discussions about which primary sources to focus on (most groups selected the three they'd analyzed in greater depth) and how to best engage the audience at the beginning of the presentation. During the presentations that began the next day, audience members took notes on what they learned about different phases of the migration. Each student used her notes in the culminating creative response to the Great Migration.

Grace's pencil rendering of the journey north



Creative Response

For two nights of homework (1–1.5 hours), you will be working on a creative response to the Great Migration presentations. The purpose of this assignment is for you to reflect on the primary sources you've seen from each phase of the migration, both in your own presentation and in your classmates', and to show some of this thinking in your response.

Step 1: Think about the various types of primary documents we've seen and choose one form to use for your response. You might consider a poem, a song, a painting or drawing, a political cartoon, a letter, or photography

Step 2: Look back at your presentation notes and think about which aspects of the Great Migration you'd like your creative piece to convey. Spend some time brainstorming and planning.

Step 3: Create!

Step 4: Write an artist's statement: spend the last 15 minutes of your homework time writing an explanation of your piece and what you hope to convey in it. For example, if you created a collage, you might explain what different color choices symbolize and how the subject of the collage relates to a specific aspect of the Great Migration. The last bit of this 15 minutes should include thorough revising and editing in another color. You will be sharing your artist's statement and creative piece with your classmates.

Our three-year curriculum cycle affords teachers a great deal of time to reflect on the scope and sequence of each year's lessons, as well as on the lessons themselves. One aspect of my job that I love is the continual quest to improve my teaching of skills and content. One of my biggest hopes is to give this unit more time so that students can be exposed to even more primary and secondary sources about the Great Migration, both broadening and deepening their knowledge about it. The change that I am most committed to making is to personalize the history through using more of Wilkerson's book. The three migration stories Wilkerson tells in *The Warmth of Other Suns* would powerfully engage students and make the facts they would then learn about the migration more meaningful. Since this unit will typically fall right after our two-week spring vacation, I plan to assign students the homework of reading and responding to one of the three stories. On our first day of class back from Spring Break, I could then group them with students who read the other two stories. They could teach each other about the push and pull factors that led their individual out of the South and about whether or not life in the North met expectations. Discussion of the similarities and differences in the three stories could lead everyone to a more nuanced understanding of the story of the Great Migration.

Despite the fact that this series of lessons was quite short, students' creative pieces showed me that they had learned a great deal about not just the factual aspects of the Great Migration but about the psychological as well. My hope was that, equipped with their knowledge of this migration, students would make connections to other migration stories and that they would now see the Great Migration story in the context of the many important migrations that have shaped American culture and society.

In my dream, I was plowing crops. I woke to my daughter's soft cries, yearning for that field in my dreams.

A train ticket could get us there, but the dream is gone.

What is left is hunger from that cotton weevil and hatred because of our skin.

I went to her, my boy John was already there.

Their eyes said, "Why are we here?" I answered with tears coming down my face.

Here is where you can find your voice.

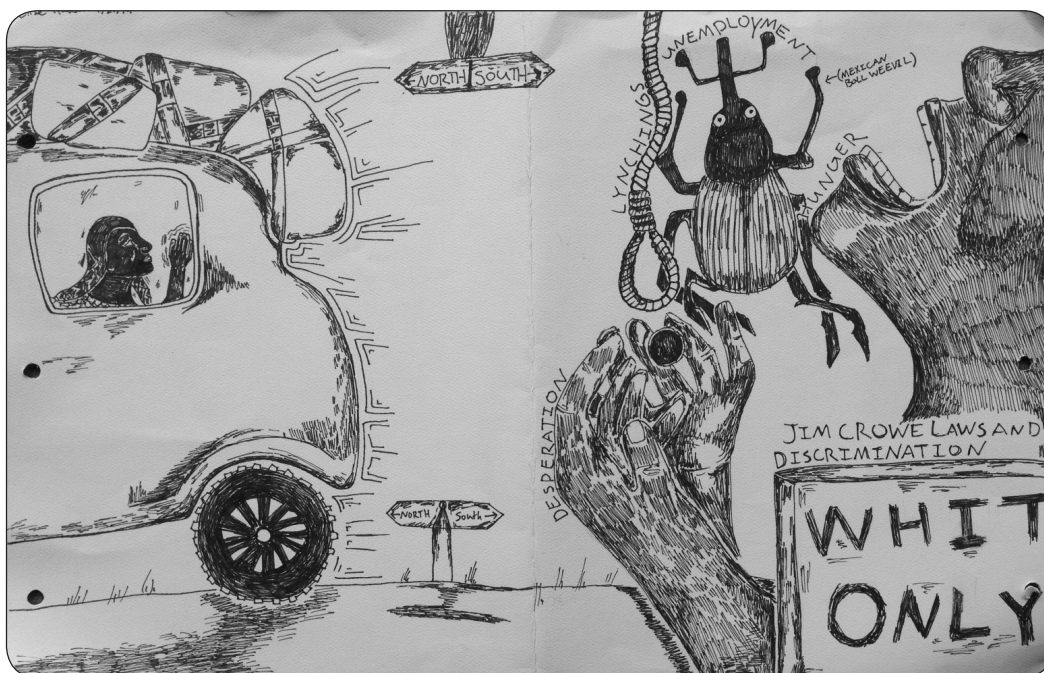
Here is where you are safe.

Here is where you are not hungry.

Here is where we will find our hopes and leave behind our fears.

-Gideon

Elise's sophisticated illustration captured the pain of leaving home as well as the suffering African-Americans endured in the South.





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Cambium

INNOVATIVE K-8 CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

THE ARBOR CENTER FOR TEACHING AT
ARBOR SCHOOL OF ARTS & SCIENCES

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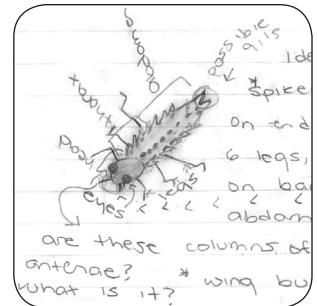
Cambium: (n) the cellular growth tissue of trees and other woody plants, from medieval Latin "change; exchange."

What content would you like to see offered in Cambium? Do you have ideas about how we can improve it? Send us an email: cambium@arborschool.org

Masthead by Jake Grant, after an 1890 botanical illustration.

The Arbor School of Arts & Sciences is a non-profit, independent elementary school serving grades K-8 on a 20-acre campus near Portland, OR. Low student-teacher ratios and mixed-age class groupings that keep children with the same teacher for two years support each child as an individual and foster a sense of belonging and community. An Arbor education means active engagement in learning, concrete experiences, and interdisciplinary work. For more information on the Arbor philosophy, please visit www.arborschool.org.

The Arbor Center for Teaching is a private, non-profit organization created to train teachers in the Arbor educational philosophy through a two-year apprenticeship while they earn MAT degrees and licenses, and to offer guidance to leaders of other independent schools. The ACT's mission includes teaching workshops and the publication of material underpinning the Arbor School curriculum.



Dragonfly larva sketch by Mia

Cambium is free! Please forward it to your friends and relations and don't hesitate to let us know if there's anyone we should add to our mailing list. Cambium came into being through grants from the Bloomfield Family Foundation, which has also generously underwritten the development of the Arbor Algebra series and the Arbor Thematic Curriculum guides. We are ever grateful for their support of our work. To purchase publications from the Arbor Center for Teaching, please visit our website: arborcenterforteaching.org.