VOL. 3, NUMBER 1

Cambium

INNOVATIVE CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

INDEPENDENT INQUIRY

In this issue

In June this year more than 200 people gathered on Arbor School's grounds for a Colloquium to celebrate mentorship and creativity. Young men and women now working as engineers, winemakers, architects, thespians, or marine biologists reunited with mentors and teachers who helped set them on a creative path. Guests with professional lives in education, politics, law, and other fields that promote mentorship joined them to tour an exhibition of the Senior Projects undertaken by Arbor eighth graders and to participate in a symposium.

Arbor's yearlong Senior Project, a requirement for graduation, offers immersion in a discipline the student wishes to explore under the guidance of a mentor from outside the school. Each project consists of a creative component, a research component, and, at Graduation, a presentation. In the past year alone, eighth graders designed net-zero houses, studied encaustic painting, wrote and performed comedy sketches and music videos, published guides to sustainable food consumption, and conducted field research for Portland Metro. One of the ways students actively hone the skills necessary for the Senior Project is through a series of Independent Projects assigned during their years at Arbor.

The Independent Project offers an annual opportunity for every student to investigate ideas currently of interest. The projects beautifully reflect each student's development and passions. There are many essential threads that Arbor weaves to build and sustain the culture of the institution, and the Independent Project, with its high expectations, remains a constant. It is a part of the common language spoken by our students.

That our Colloquium guests might better understand this prominent feature of an Arbor education, teachers and parent volunteers mounted an artful show that highlighted broad examples of K-7 Independent Projects. From a kindergartener's look at the gestation of human infants, with several examples of fetus-in-utero fashioned from clay, to a fifth grader's masterful diorama of a World War II battlefield (complete with scale model tanks and soldiers), each project reflected a thorough topic immersion. Each student had become an expert, mastering the subject in developmentally appropriate ways. A set depicting Philippe Petit's 1970 high-wire walk between the World Trade Center Towers was a fine example of the diversity of student interests each year's projects encompass. The attempt at scale was evident and the research impeccable. A seventh grader's guide to acupuncture on large mammals — the artistic component included a horse fashioned from clay, complete with needles on the relevant points — was a masterful undertaking.

continued

ARBOR SCHOOL
OF ARTS & SCIENCES

Jack explains his Senior Project to former Oregon governor John Kitzhaber

The giant squid, Japan, deciphering secret code, the human tongue, and the lost minutes of the Nixon tapes (with a reenactment of how his secretary might have lost those minutes) were other recent topics.

Each project on display included the initial questions the student was interested in researching and the teacher's specific outline of expectations, a kind of recipe that encourages some unexpected ingredients. The show included rough drafts to illustrate where students began and the sometimes-circuitous path to completion.

As the Colloquium drew near, students were given time to view the K-7 and Senior Projects, ask questions, and draw or write about what captured their attention. This time was among the finest moments the school community has witnessed. With teachers as docents, the students were genuinely engaged museum visitors, viewing the work of both older and younger peers. Lovely commentary emerged as students walked through the exhibits. They could be heard excitedly discussing the particular tanks used on the battlefield, exclaiming "I didn't know he knew so much about this" or "I want to study that when I'm an Intermediate." Suddenly, peers were elevated to a new level and seen as topic experts. Students, unbidden, sought out the child whose work they admired to ask questions after leaving the show. Although we work at blurring the boundaries between grades, so that all students know one another, students normally see only their classmates' and siblings' independent work. This was a student-to-student instructive opportunity on a different level. The interest engendered forced us to reconsider how students will engage in Independent Projects and how those projects will be "viewed" in the future; the Colloquium displays elicited such awe and enthusiasm throughout the school, it has us imagining some version of this show at the end of each year.

Welcome, then, to a new volume of Cambium as we consider how these Independent Projects can be supported at school and at home, how they can grow from curricular content, and how they can encapsulate each child's developing sense of self and skills as a researcher and teacher.

– *Deborah Mandelsberg*

Intermediates test the workings of a Rube Goldberg device created by Nic Henrichs, who graduated from Arbor in 2001

ENTHUSIASTS BECOME AUTHORITIES
PRIMARIES PRACTICE RESEARCH & PRESENTATION

by Lori Pressman

"Stand back, stand back, time machine coming through!" exclaimed Miles as he dragged an old refrigerator box into class. The box was now equipped with a dial marked for specific dates, a door, and a recycled motherboard to power the machine. Miles was presenting his Independent Project on inventions, and this time machine was the vehicle for teaching his peers about significant inventions throughout history. With his classmates' full attention, Miles introduced his project, set the time machine for ancient Greece in 300 BCE, and hopped inside. Electronic sounds from a Darth Vader mask (hidden in the time machine) helped to build his audience's anticipation and to disguise the sounds of Miles rummaging around in the box. He emerged from the time machine wearing a toga. Using a poster board with pictures, diagrams, and information, he taught the class how the Greeks were the first people to invent catapults and explained how Archimedes's Screw worked. Then Miles set the dial for 1903, Kitty Hawk, North Carolina, and stepped back inside his time machine. The machine lurched, strange sounds emanated, and eventually Miles walked out sporting a leather aviator's jacket, newsboy hat, moustache, and his legendary smile. He was Orville Wright. Using a model, Miles explained how Orville and Wilbur Wright invented the first successful airplane. He told a story of the brothers experimenting with wind and becoming the fathers of flight. Miles set the time machine two more times, first to the future and then to present day, where he returned to his original clothes and shared with us the color changing experiment on which he was then working.

Every child has interests and passions that lie beyond our curriculum, whether a long-kindled interest in pandas, a budding curiosity about cooking, a fascination with bruises, or a desire to learn more about head lice. Each spring the Arbor Primaries (K/1) have an opportunity to explore a topic of their choosing and share their findings with their classmates through an Independent Project. The children become "authorities" on their chosen subjects and teach their classmates what they know. We always find it remarkable that long after the presentations have been given, the students still seek one another out with questions or comments that pertain to their Independent Projects. When a child finds a chunk of moss growing on a stone, she'll make sure to show Ruby; when someone is curious about the size of a dolphin's dorsal fin, he can ask Penelope. By sharing their enthusiasms with each other, the kids reveal more of themselves, bringing us closer and engaging us as a community of learners.

Since our classes are multi-age, the first graders all have experience with Independent Projects, both as learners/researchers and as learners/audience members. Their eagerness is infectious and helps to build anticipation well before we start working on our projects. When we finally take our first step, creating a list of possible subjects, the students are bubbling over with excitement. Working collectively, we generate some general ideas about subjects along with specific examples. Animals are a common interest; people, places, and sports are also broad topics that can help stimulate children to imagine all the different subjects that intrigue them. Having the kids share their ideas during this brainstorming session helps each child write a list of enticing possibilities.

After their lists are created, we ask the students to put stars by their top three choices. We send these papers home so that families can have a chance to discuss the options and kids can learn about resources that might be available. Maybe an aunt knows how to make candy or Great-Grandpa could answer questions about World War II. The kids return to school the next day with a project in mind, ready to research.

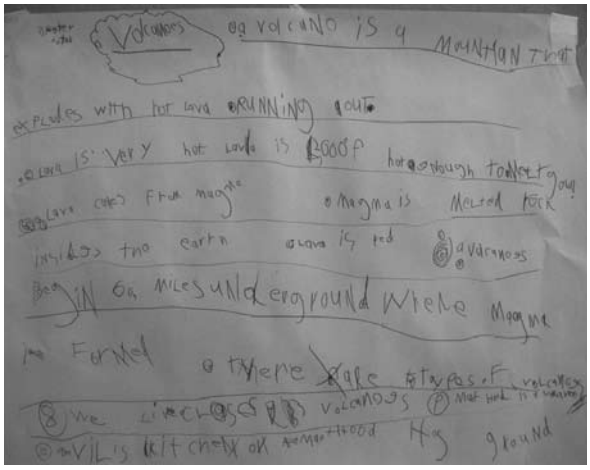
Once the topic has been determined, the students prepare a planning sheet to guide them through the researching process. We begin by thinking about available resources.

Will you read books? Look on the computer? Conduct an interview? Watch a video? Experience an activity yourself? Go to a museum? Then we ask the kids to think of three questions that they have about their subject. The students are not limited to three questions, but this process helps to establish the practice of generating authentic questions and pursuing the answers.

The second half of this planning activity focuses on the presentation. *How will you teach your classmates? Do you want to paint a poster? Make a diorama? Create a model? Draw a diagram? Do a dance?* The students then have a chance to sketch out what their presentations might look like. Again, these papers go home with the child along with a letter for the parents explaining the assignment further.

Checking in with the parents as they embark on their child's first research project is the next step. It's hard to imagine what a K/1 project might look like, and parents often appreciate examples of how a presentation could be structured and what props could be created. Some children use the questions they generated earlier to guide their presentations. They might make note cards with the questions on one side and the answers on the back. Other students create poster boards with pictures and captions to help teach their classmates. We encourage parents to be mindful of the amount of text their child can manage and to steer them away from long research papers. Hands-on and visual activities are more significant for their children, presenting an opportunity for the kids to consolidate what they have learned and to truly make the project their own. In the process of building a diorama of koalas among eucalyptus trees, a child is able to more fully understand the concept of habitat; in the making of a solution of water and sugar a child can see crystallization occurring before his very eyes; in the replication of a Degas sculpture a student can begin to appreciate the anatomy of his ballerinas' long, graceful limbs.

We teach emergent readers to make note cards that bear pictures or key words to trigger an idea or fact that they want to convey.



Peter's display for his study of volcanoes. The illustration was almost as tall as the presenter.

Gauging the support that a child needs is another lesson for parents, and they may need help figuring out their role in this process. To the greatest extent possible, we want the Independent Projects to be the children's, but of course they are going to need help. Setting aside time is the best thing families can do. Whether reading books, looking at pictures, or writing to or visiting experts, active participation in the research process takes time and little doses each day are more beneficial than cramming it all into a weekend. The Independent Project can be exciting for the entire family as they all learn about a new subject. Some parents can be overly eager to help with the construction of dioramas and models, and it's a good idea to remind them that a lopsided child-made igloo is actually more powerful than a perfectly symmetrical one made by Mom.

We generally give families about three weeks to complete this project, which is plenty of time to synthesize new material and prepare their props.

After weeks of preparation at home, the kids are eager to share what they've been working on and to learn about the interesting things their peers have been researching.

We set aside one hour each morning for two weeks and have between one and three presentations each morning. A presentation sign-up sheet is up in class, and we encourage our Old Hands (first graders) to take the first few slots. They have experience with presenting Independent Projects and our New Hands (kindergarteners) learn so much from them. They learn about the structure of the presentation as well as the expectations of the audience. The kids begin sharing their findings with the class in a variety of different ways. Some read from papers or cards while others use their poster board or diorama to guide them through the information. Books, clay models, diagrams, audio clips, and food samples are often included in presentations. After the child feels finished with her report, she asks, "Are there any questions or comments?" It is often during this time that the depth of her knowledge and understanding is truly revealed. This is also a time when facts can be clarified: a tiny human embryo is *the size of* a tomato seed, but you can't actually grow a baby from a tomato seed as one young audience member hoped! Each presentation concludes with a "thank you" and a round of applause. As we transition between projects, we ask the audience members to recall some memorable facts and things that they'll remember about the presentation. Writing these down on a blackboard or easel pad reinforces that fact that these young researchers are teachers, and we have valuable things to learn from one another.

One lesson that we hope all our students learn is that there is no single way to do an Independent Project. Not everyone can create a time machine, but maybe you can write a script and film a short movie, sew a life-size model of a river dolphin out of pink fleece, build a Lego scorpion with a hinged tail, dress up as Cleopatra and write hieroglyphic nametags for all your classmates, train your pet rats to walk on a tightrope, make a class set of quill pens, or sing a few African spirituals. The possibilities are endless, and each year the level of enthusiasm and creativity that the kids bring to their Independent Projects is amazing.

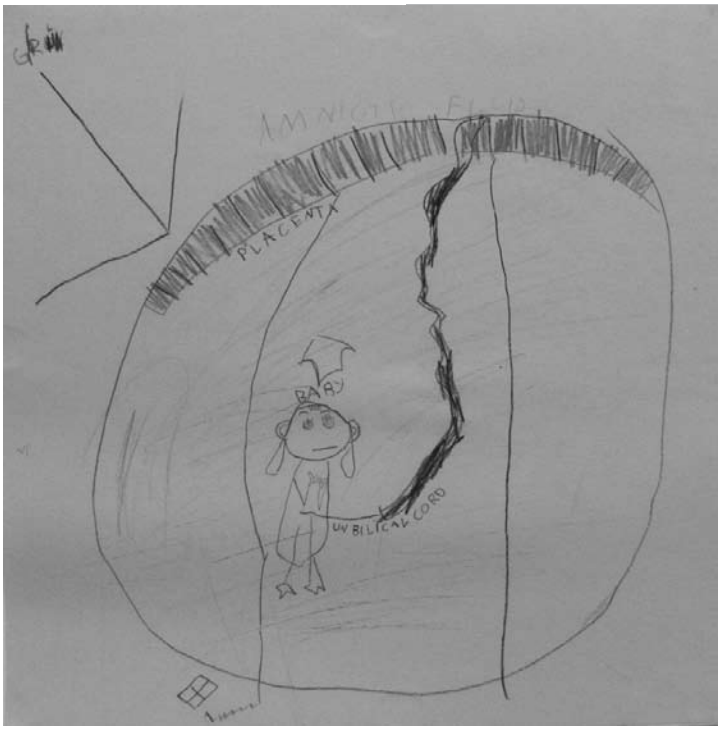
We ask the kids to leave their projects at school for a couple of weeks, creating an Independent Project museum of sorts. This gives students an opportunity to reengage with the projects and to ask follow-up questions of one another. Seeing their classmates, older buddies, other parents, and teachers review their projects is yet another way that these young researchers can witness the genuine value of their efforts.

Reflecting on the Independent Projects is an important conclusion, and it provides an opportunity for the students to look back on their accomplishments. Interviewing each child independently, we ask the following questions: *What part of your Independent Project did you enjoy the most? What was hard? What is some advice you would give to someone who is doing an Independent Project for the first time? What do you want to do for your next Independent Project?* In reviewing the collection we learned that most kids enjoyed sharing their projects with the class. "I liked passing around the pennies, because I was proud of them," remembered Shane. Sydney, who studied Japan, liked "talking about the map. I thought it was interesting that there were 6,800 islands." Reading and finding facts, building models, and writing ("all those note cards — my hand got tired") were some of the challenges the kids faced with their projects. Harper said, "It was sort of discouraging when my foxhole radio didn't work, but then we decided it could just be a model." Peter remembered, "Standing up in front of people and having them clap was hard. I just looked at my sister."

Learning Logs are booklets in which each student writes facts learned from the presentations. There is a page allotted for each presenter, and an entry looks something like this:

Benjamin – Legos
1. Lego means "play well" in Danish.
2. Lego testers squeeze and bite the toys to make sure they are strong.
3. There are Star Wars and Harry Potter Lego kits.

We have found that writing down a few facts helps the kids remember what they have learned from one another. Generally a set of presentations lasts 30-45 minutes and then the kids can grab their Learning Logs and jot down the highlights.



A detail from Nili's project board showing a human baby in the womb

I send home a note with each child after the presentations. Generally, I thank them for their hard work and give them specific feedback on the strengths of the presentation.

In fact, our young students had a wealth of advice for anyone undertaking an Independent Project. Greta counseled, "If you have something you really like and have been liking it for a really long time and you've been having lots of questions, you should just study it." Vivek recalled his research process and suggested, "Since fact writing is hard, just do one part at a time — one on one day and more the next day at breakfast." Many children focused on the presentation aspect. Zia said, "It's just like reading and being in front of a big troop of kids and some are in chairs and some are on the floor. It's really okay. I was too scared to practice it at my house. But I saw Holden and Theo do it, and I felt a little braver 'cause my friends were there." Harper advised, "Speak loud, look up at the audience, and engage the audience. If you are reading, look up every once in awhile to see if your audience is enjoying it. If they're not, put in something that would make them really want to listen." Having experienced an Independent Project first hand, the students now have a heightened awareness of topics that interest them, knowing that they could research that subject next year. Nearly every student had a specific topic or general direction for the final question about what they'd like to study next. Cole had already checked out some books on giant squid and thought he might research them over the summer in preparation for an Independent Project on the ocean next year. At this point it looks like we'll be learning about pyramids, China, anteaters, ladybugs, skateboards, penguins, queen bees, pearls, the Grand Canyon, and Teddy Roosevelt. Primaries are curious and empowered learners, so "Stand back, stand back!"

THE ART OF INFECTIOUS CURIOSITY

JUNIORS LEARN TO HOLD THE FLOOR

by Peter ffitch

From their first weeks as students at Arbor, children begin to anticipate the milestones and big events that punctuate their time in each grade. For the Primaries (K/1) it may be the Greek play or the opportunity to step inside a life-size model of a whale. For the Juniors (2/3) it most certainly is the day-long trip on our own version of the Oregon Trail, but the Lewis and Clark expedition and the Biography Ball also loom large. Children look forward to overnight field trips during their fourth- and fifth-grade years, as well as the opportunity to experience Inventions and Discoveries first hand. The younger children's anticipation for their opportunities as Seniors (6/7/8) is strengthened by the fact that they are invited to participate as audience members for the Senior play, the African celebration, and Diwali. They witness the fun the older students have with these events and eagerly anticipate their turn. There is one big event, however, that the children look forward to that they can experience every year: the Independent Project.

That the Independent Project happens each year for each child is significant beyond the fact that they need not wait too long to enjoy them. Together with performances at assemblies, announcements shared with the class or the school, roles in plays and skits, and the many opportunities to present within the course of each classroom year, the Independent Project serves to give repeated practice in gathering and sharing knowledge with an interested and supportive audience, skills that we feel are fundamental to elementary education.

In the Junior class we schedule the Independent Project presentations as the culminating classroom event of the school year. The opportunity for independent

reading, research, writing, organization, and presentation provide a nice opportunity for year-end assessment of skills that we have focused on throughout the previous months. We begin each year with explicit instruction and practice in reading non-fiction for specific information and build organizational skills in the process of working together on short non-fiction pieces. We introduce a variety of methods for taking notes and stress that all facts presented in non-fiction writing must be supported by evidence found through research. We introduce the concept of the paragraph and take the time to support students in writing and rewriting for clarity and accuracy. We hope that all of these skills are practiced during the development of the Independent Project and that, armed with these tools, our students are ready to take on their projects with an appropriate level of independence.

We do not formally begin to discuss the Independent Project until April, after we have returned from Spring Break and have settled into our final thematic unit of the year. Yet we find ourselves talking with children about them almost from the first day of school each fall. Students want to know when they will happen, they want to share their latest idea for a topic, they wonder if it would be acceptable if they began to read for information now, or to gather information on a winter vacation with their families. Parents check in, too, to let us know that conversations about topics are happening at home and to confirm that any productive course of study is really within the bounds of the assignment. And students talk amongst themselves. We overhear lunchtime exchanges of plans for the future as well as fond remembrances of presentations past.

These student conversations serve a number of important purposes. They are an indicator to us of the importance of this element of our curriculum. They provide evidence to us that our children are motivated and independent learners. And they provide the children with important feedback about their thinking. Students find out if their peers share their curiosity about a given topic and whether they might enjoy learning more or, in the alternative, whether others in the class are already experts. Some students take comfort in sharing their ideas and collaborating, while others choose to keep their topics secret until they make their presentation. Knowing that classmates are looking forward to one's presentation can be a wonderful motivator.

Marina's coral reef diorama, complete with samples of different coral species that her audience could handle and admire

These conversations also make clear an important fact: it is the presentations that are the most important element to the children. As teachers and parents we value the reading and writing that these projects encourage and we support students in developing good questions and in finding organizational strategies that work. We also see value in the long term nature of the assignment and see it as an opportunity for children to begin to learn time management. But the students care most about what happens when they stand up in front of the class, when they hold the floor as teachers. They want to engage their classmates, to have them share in their enthusiasm for the subject. They want their classmates to enjoy themselves, too, to have fun as they learn.

The children's choices of topics cover an incredible range. They take inspiration from family trips, books read, classroom inquiries, student presentations from years past, and current events. We have recently had students teach us about Alcatraz, electric cars, honeybees, and graffiti. We've been entertained by magic tricks, learned about the workings of the inner ear, and watched a dog demonstrate newly learned tricks. These projects provide us with an opportunity to loose the curiosity of our students and for them to take the responsibility for inquiry beyond the limits of the school curriculum. Within their choices of topics there is ample room for creativity as children craft questions, choose where to sharpen their focus, and plan a presentation.

With this in mind, we put the bulk of our classroom support of the Independent Projects into helping children think about how they plan to share their expertise with their classmates. We begin this process early, while children are still solidifying their choice of subject, so that if a topic does not ultimately lend itself to an interesting and successful presentation, the child can modify his focus. To some extent this process happens naturally. While children begin to narrow their own choices, they remember their own previous efforts as well as the successes of others. As a class, we discuss effective teaching. We talk about challenges we all face when a teacher lectures too long without allowing us to interact directly with the material. We acknowledge also that there is a real art to managing direct engagement so that the time is productive and the student-as-teacher remains in control. Our students reflect on what they know has worked for other presenters as well as what helps them learn in the classroom every day. They know that they would rather have someone speak directly to them than read a prepared text. They know that they would like the opportunity to ask questions or to test their new understanding as they take in new knowledge. And as presenters, they know that it is difficult to make a well-organized and effective presentation without notes. These informal discussions have a noticeable impact on the children. They begin to see that there is an art to making a successful presentation and they gain some insight into what their teachers do to prepare to teach them each day.

Although we schedule the students' presentations during the final two weeks of the year, ideally planning for no more than three each day, we invariably have one or two students who wish to present ahead of schedule. We are happy to accommodate them. Not only have we found that it is best for these students to be able to strike while the iron is hot, but these first presentations are important teaching opportunities. When our first presenter is ready, we acknowledge that she is taking on a special role by being first. We let her know that we will be learning from her approach to teaching the class and also that we will practice being a supportive audience. Fortunately, these early birds are invariably deeply immersed in their subjects and are well prepared to speak to their classmates with authority. We can count on them to present well and to respond to questions as the experts that they have become. Afterward we take the time to point out the successful techniques that these children have chosen to use. The children in the audience offer supportive commentary as well, and it is this praise from peers that inspires subsequent presenters to put extra time and effort into their presentations. Hearing "I really liked the way that you looked right at us while you talked to us," or "It helped me understand when you showed us the parts of your model while you explained how it worked," makes it clear to these children what will work for them. The students also pick up on the careful way we might ask about a technique that was not completely successful, perhaps asking the student/teacher if there was anything about his presentation that he found challenging or would do differently next time. Even without our drawing attention to what did not go well, many of the children will learn from their classmate's experience.

In addition to taking the time to draw attention to effective presentation techniques, we also take the time to highlight our successes as an audience. We recognize specific questions that were supportive and provided the presenter with an opportunity to show the true depth of his understanding. We draw a clear distinction between questions and comments, a line not always clear to seven- and eight-year-old children, and we discourage the sharing of personal stories that shift the focus from the presenter to the audience member.

Conveying one's own curiosity is the key to an engaging presentation and to an engaged audience. Through the Independent Projects we seek to honor curiosity in our students. In turn we are rewarded with an infectious degree of effort and creativity that puts a wonderful capstone on each year in the Junior class.

SUPPORTING INDEPENDENCE
STUDENTS, PARENTS, & TEACHERS BUILD A FOUNDATION

by Charles Brod

As a parent and a teacher, I've seen Independent Projects from both sides of the street. What holds true at home and at school is the need to help each student set worthy expectations that can be achieved with the greatest possible independence. One key to this is communication between child, parent, and teacher.

At the Intermediate level (fourth and fifth grades), students take on an Independent Project as part of a larger study of self within the two-year curriculum. In conjunction with the Independent Project students generate a range of in-class work such as a self-portrait, essays that capture who they are as readers, self poems, and writings that encompass past experiences and future possibilities. In this context the Independent Project becomes a barometer of growing autonomy and evolving intellectual interests. It is also a prelude to the yearlong Senior Project our students will undertake as eighth graders; as sixth and seventh graders their Independent Projects will be rooted in curriculum, so the Intermediate projects are an important opportunity to stoke the fires of each child's individual curiosity and heighten her anticipation for a whole year of independent inquiry. But most immediately it is our job to help guide the child's planning, thinking, and efforts to support an engaged and enthusiastic experience over the course of the six-week project period.

The Independent Project is launched at the beginning of the winter term in January. We ask students to consider possible topics over Winter Break and then return on the first day of school having written a project proposal.

In laying out this assignment it is important to communicate certain expectations to both the child and the parents. While the project is independent in nature and open to an array of possibilities, "Goldilocks" criteria are in effect: choose a project that is neither too much nor too little to complete in the course of six weeks; a project that is fun and engaging but at the same time substantive in content; and a project that is accessible yet requires a stretch in skills and abilities. As we lay these ideas out for students and parents, discussion naturally turns to successful projects from years past. We warmly remember the student who learned how to draft a sewing pattern in order to create tailor-made pajamas. We admire the large magnetic calendar that graces Arbor's front office, boldly painted with a border of seasons and the life cycle of a salmon and adorned with special festive magnets for birthdays, holidays, the full moon, and other events.

At home the trick for the parent is to support a child's thinking about possibilities. An interest in pets might naturally extend to a project about dog agility and training or anatomy and veterinary medicine for horses. Family discussion may open doors to topics a child might not think of, such as early voice recording on cylinders and records. We caution only that the interchange can go wrong when suggested topics are too near and dear to the parent's own interests and don't allow for the child's own exploration. Families should brainstorm, too, about the presentation possibilities for the chosen topic. A child who is anxious about speaking before a large audience may need extra support at home and at school to find a subject he feels he can tackle without becoming overwhelmed by the presentation component.

Given the prominent place independent projects hold at Arbor, students are well practiced at cooking up proposals and pursuing interests by the time they become Intermediates. Consequently, it is rare for a teacher to need to renegotiate a proposal with a student. Occasionally the proposed study seems too thin to hold a child's interest for such a long period. Other times the subject is so esoteric that we have qualms about a student's finding appropriate resources. Senior Project proposals will be similarly

vetted and perhaps recast so as to preserve the student's intrinsic enthusiasm for the material while ensuring a sensible degree of challenge. At both grade levels, students are encouraged to pursue interests that take them into and beyond book learning, that develop their artistic skills, get them out into the community, or require them to build something with their own two hands. Writing makes up an important part of the project and often holds a central place in the final product as a way of formalizing and communicating the student's new knowledge and skills, but at the Intermediate level a lengthy written report is not a requirement.

Once student and teacher have mutually agreed upon a project, the student receives a project journal that becomes a vehicle for planning, tracking progress, reflecting on the process, and dialogue. The journal is usually a simple teacher-made booklet or even a pocket-sized memo pad.

Students' first assignment is to parcel out project work over the six weeks of the study. This gives them the opportunity to think creatively about how they will accomplish the work and keep themselves engaged from week to week. Of course this schedule may need to be adjusted; it is difficult even for adults to accurately estimate how much time the research process will require or how time-consuming the construction of a scale model will be. But the planning step gives teachers further insight into the student's thinking. Children may quite naturally desire to rush into the making and doing parts of the project and may need to be first invited into the careful research and thoughtful preparation that will bring greater quality to the project. Intermediates can readily appreciate that a model of a castle built on thorough knowledge of castle design and construction techniques will be a truly memorable project.

Reed's diorama of the Allied Invasion of Normandy channeled a broad interest in World War II into a specific project achievable in our time frame.

Helping students become planful and articulate their ideas is a big piece of this project work. The project journal is a formal way to foster that development through written dialogue. The planning component also helps to inform parents of just what the child should be working at from week to week, allowing them to assist more effectively.

The journal is also a place for the child to reflect on her work. Each week we ask for a progress report and a response to one of these questions: *What drew you to this project? How did you come up with the idea? What have you found most surprising about this project? How have you had to alter your plans in the course of your work? What obstacles have you encountered? How have you overcome them?*

Through journaling and conversation, a teacher can support a student strategically, particularly if the child is worried about some aspect of the project. Some students may encounter a seemingly insurmountable roadblock to the completion of a project. It is really the teacher's job to listen to the concerns of students and then coach and guide them to successful outcomes.

The reflective journal also models an important component of the Senior Project. During that effort, the check-in dates will be spaced farther apart and the conversations will be with the school's Director. Expectations for quality and evidence of progress will be high. The Independent Project experience in the Intermediates helps to build a foundation for that work.

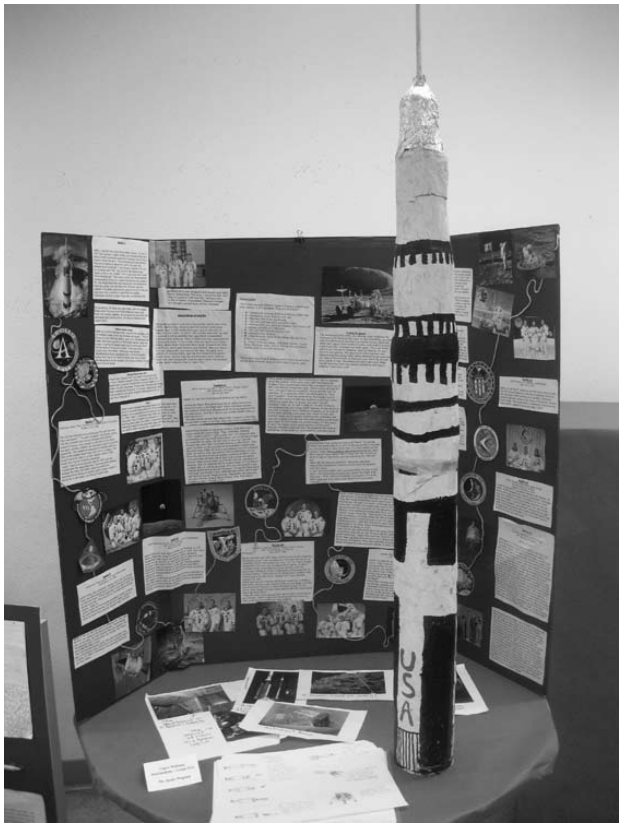
Guiding questions can be: *What visual aids will you have? Will your audience actively participate in the presentation? How will you practice your presentation?*

As the Independent Project draws to a close, we also ask students to think about how they will present their work to their peers and parents. This we do in the form of a class or small group discussion so students can hear a range of ideas and brainstorm together. They are then asked to put their thoughts down in the journal. At times the teacher may need to work closely with individuals on developing this part of the project. Arbor children by this time have been audience members for a number of peer presentations; they recognize what has engaged them in the past and often strive for

that level of engagement with their audience. For some, public speaking will occasion real anxiety. Those children receive our extra support as we listen to their worries and work with them to build strategies and tools that will help them feel more confident during the presentation.

Throughout the project time frame we communicate with parents about realistic expectations for the quality of the work and the presentation aids. Over the course of an Intermediate career, students learn to set the bar high in terms of quality when preparing posters and other visual aids. The Independent Project is a time for students to transfer those habits of care, skillful use of tools, and commitment to handmade work to the home environment.

Students naturally want to be prepared and to do well in presenting before their parents and their peers. Often the rehearsal of a presentation is the easiest piece to accomplish. The first project presentations routinely serve to demonstrate the high level of work that fourth and fifth graders are capable of achieving and may inspire children presenting on a subsequent day to give their material an extra polish. Once again, this is important practice for the Senior Project, which concludes with a presentation to a packed auditorium of teachers, families, friends, and mentors at Graduation. Senior Project mentors, who have worked closely with one student over the course of the year but are often strangers to the school, invariably comment that they are deeply impressed by the skill and poise all of our eighth graders exhibit in telling the story of their projects and their own growth. It is important to note that this ability does not suddenly descend upon them in their final year at Arbor, but is coaxed to the fore from the very first time a kindergartener is invited to recite a barely audible poem or perform a quavering violin solo at the all-school assembly. The Independent Projects — along with steadfast support and encouragement from the whole school community — hone and temper those presentation skills year after year until the child can confidently hold forth as an expert among peers and adults.



Claire's investigation of the Apollo space program was born of a chance encounter with William Burroughs's history, This New Ocean, *on her parents' bookshelves. The Independent Project is a perfect opportunity to explore a new interest in greater depth.*

Once projects are complete, we ask student and parents to reflect on the process and think about what went well, what difficulties arose, and what might be learned from the overall experience to guide future efforts in developing the habits and attitudes of independent learning for all concerned — student, parent, and teacher.

Students and parents write separate reflections, but some of our parents have told us that, rather than just handing in this feedback to the teachers, they found it helpful to confer with their children and approve each other's work, discussing how they might adjust their "independence" next year.

STAKING A CLAIM IN ANCIENT CHINA
ROOTING INDEPENDENT PROJECTS IN CURRICULUM

by Eliza Nelson

What do the suspension bridge, the moldboard plow, porcelain, tai chi, paper, and the wheelbarrow have in common? They are remarkable Chinese inventions chosen as topics of study for sixth- and seventh-grade Independent Projects at Arbor last spring. We invited students to enhance their understandings and enrich their writing with models, illustrations, and creations. As teachers we had the pleasure of watching students claim corners of our curriculum for their very own. We witnessed, once again, how designing and doing enhance intellectual engagement. As a result, we became intrigued by this model of linking extended Independent Projects to curriculum-defined research assignments.

By the time they reach the Senior class (sixth-eighth grades), Arbor students are experienced at propelling themselves through Independent Projects. Many have begun to anticipate the rewards, challenges, and possibilities of their culminating independent endeavor: the yearlong Senior Project. In sixth and seventh grade they continue to grow toward this grand finale, engaging in a range of independent pursuits: science experiments, country studies in Spanish class, and research papers in Humanities. This year, in connection to the school-wide Colloquium on Mentorship and Creativity, we decided to shape one of our Humanities assignments into a creative Independent Project.

A detail from Anna's display of botanical drawings and samples of herbs used in Chinese medicine

Our curricular theme in the Senior class this year was Change and Continuity, which we considered while exploring the cultures of South Asia, Africa, and China. In planning for our spring study of China, we wanted to find a way for students to fathom the long history of invention and discovery that led to remarkable Chinese achievements in the arts, sciences, and technology. For each student to focus on one such achievement — researching, writing about, and creating a model or representation of it — seemed a promising avenue to true engagement with and appreciation of extraordinary accomplishments in ancient China.

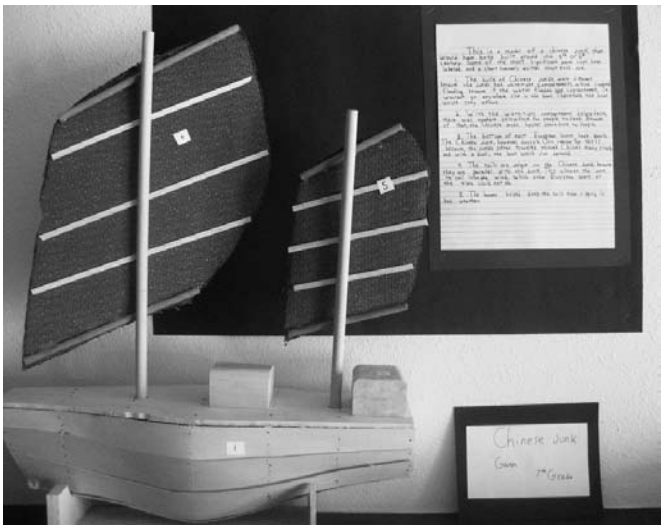
Readings

To launch this eight-week adventure, we began with what we hoped would be some provocative readings, exposing the students to Voltaire's view: "Four thousand years ago, when we couldn't even read, the Chinese knew all the absolutely useful things we boast about today." We also shared Robert Temple's claim: "One of the greatest untold secrets of history is that the 'modern world' in which we live is a unique synthesis of Chinese and Western ingredients. Possibly more than half of the basic inventions and discoveries upon which the 'modern world' rests come from China. And yet few people know this. Why?"

As we had hoped, our classes became lively with questions and wonderments: *Gutenburg wasn't the first to invent moveable type? How do we know when someone is borrowing an idea from another land or inventing it purely on his own? The Chinese developed lacquer, the first plastic, 3,200 years before the West used it!*

Broad topics

The students worked in table groups to examine a chart displaying time lags between Chinese inventions and discoveries and their adoption or recognition in the West. They shared their interest in China's early innovations: kites, compasses, negative numbers, gunpowder, strong beer, and paper, to name a few. At the end of the period, we asked each individual to select a topic area for further pursuit: geography and exploration, literature and arts, math and engineering, or medicine, botany, and agriculture. We sent each student home with a substantial packet of background readings related to the topic of her choice and a list of guiding questions to consider while reading. *Oracle Bones, Stars, and Wheelbarrows* by Frank Ross quickly became our favorite resource, amply accessible and engaging to middle-graders readers.



Garen's model of a Chinese junk, each feature accompanied by an explanation of its innovative construction

For most research projects, we feel it is important for our students to explore openly for a time, gaining a sense of the larger context before narrowing their focus and beginning to plan or take notes. So we asked them to read for several evenings, providing time in school to meet with classmates who were pursuing the same topic area. Each group discussed their readings, guided by the sets of questions from their teachers, and worked over the course of three meetings to plan a presentation to the rest of the class about the crucial information and ideas they had gleaned. On the day of the presentations students took notes, gaining exposure to topic areas they had not yet explored.

Independent investigation

By now our students were eager to specialize. We gave them a detailed map of the Independent Project assignment, which we had purposely held back during the exploratory phase. They surveyed the list of possibilities we teachers had generated: a three-dimensional model, a working invention, diagrams of Chinese technologies, a hand-drawn map, block prints of Chinese plants, a presentation of Chinese poetry using brushwork calligraphy, and so on. The students seemed confident in selecting exactly what they wanted to study and in envisioning the creative piece that would be central to their project exhibit. For homework we had them prepare a detailed project proposal listing materials, support needed from parents, questions, potential challenges, and a week-by-week plan for the work to be done at home over the next month.

Plans for models of the Great Wall, a suit of Chinese armor, a wooden Chinese junk, a small-scale Chinese garden, an illustrated book of Chinese herbs, and many more flooded our desks. After reading each plan carefully and discussing adjustments with individual students, we approved the project proposals and cleared the homework decks for the next four weeks to allow for in-depth work. In order to keep track of progress, we gave each student a small project journal (a stapled booklet of lined paper) to hand in every Monday, addressing such questions as: *What have I done this week? What is going well? What is not? What are my next steps?* This enabled us to see whether a student was moving too slowly, still gathering supplies after Week Three, or charging along too quickly, almost finished by Week Two. We also could help students with particular issues and questions by conferencing with them or commenting in their journals.

Writing

While much of the creative work connected to our curriculum takes place during Humanities or Design classes in school, this time the making evolved at home. We had a wonderful opportunity, then, to guide students through the written component of the China project at school. Typically in the Senior class we assign the different phases of research and writing for homework, so it was rewarding to watch the entire process unfold for each student before our eyes. Over the course of two weeks, having provided the students with new packets related to their specific topics, we asked them to use the Cornell method for note taking and an outline or graphic organizer to assist in structuring their arguments. We interspersed this work with group discussions and quick writing assignments to help each student determine the crucial aspects of his Chinese invention or discovery and to ponder its effect on change or continuity in China.

Lia augmented her study of reflexology with life-size models brightly painted to map the connections between regions of the foot and other areas of the human body.

All of these experiences — the period of general reading and sharing, the specialization and project planning, the group discussions, the supervised note taking and concurrent making of the creative component at home — seemed to provide the immersion we were seeking for our students. As a result, almost all of them were able to sit down with solid notes and a well-crafted outline and draft a two- or three-page essay in less than two hours. Once revised, many of these papers became crisp culminations of the students' thinking on their topics.

Having worked for weeks to craft a model of a Chinese junk, Will wrote, "Virtually all of the features necessary to an efficient... boat were developed by the Chinese and then later adopted by the shipbuilders of the West." Brendan, who built a working seismograph, marveled at the implications of such an invention in ancient China: "This device could help people locate other people who were caught in the earthquake... [and] prevent food shortages and riots, thus helping the stability of the government." Sara, who seemed to become part engineer during her intricate study and construction of a suspension bridge, wrote with admiration: "The river rushes through a deep gorge high in the Himalayas of ancient China. It smashes through, against the cold, hard rocks as it spits tentacles of water high into the air. But above, untouched by the chaos and violence below, hangs a bridge, swaying gently in the mild breeze but still anchored firmly in place. Suspension bridges such as this were one of China's most fail-proof ways of crossing deep gorges to establish and maintain communication and trade with Tibet, India, Pakistan, Nepal and other southern neighboring countries."

The students' clear conclusions helped us, as teachers, come to one of our own: if you can carve out the time, it is worth linking extended Independent Projects to specific curriculum objectives. As always, choosing, designing, and doing lead to deeper investment in the academic material at hand.

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Olivia's 1:10-scale model of the Great Wall simulates the brick-and-mortar construction technique used in portions of the Wall built during the Ming Dynasty.

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Cambium

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

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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.

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Chinese brushwork by Elliott Friedman

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