
Open Portfolio Project

# RESEARCH BRIEF 4

MakerEd

Creativity Labs

Maker Ed

Open Portfolio Project: Research Brief 4

# MAKER PORTFOLIOS IN SCHOOLS

**Stephanie Chang & Lisa Regalla, Maker Ed**
**Anna Keune & Kylie Peppler, Indiana University**



## How Are Makerspaces in Schools Using Portfolios?

As seen in the field sites previously highlighted in "The Importance of Portfolios for Makers," youth-oriented programs and makerspaces are approaching portfolio design and development in unique ways. For some, portfolios are seamlessly integrated into the design and display of artifacts, activity stations, and the physical space. For others, documentation starts as an internal process and then carefully spreads and engages with a wider audience. No matter where our field sites are in their own processes of portfolio creation, it is becoming clear that portfolios, whatever form they take, are a convincing means through which making—and learning—is captured.

In our research and field site visits, we see emerging patterns across all settings as well as distinct differences, often specific to the audiences and communities served. In the cases presented in this brief, we examine four very different schools in K–12, all situated to bring portfolios and making to the forefront of their work. They are Monticello High School in Charlottesville, VA; Lighthouse Community Charter School in Oakland, CA; Marymount School of New York in NYC; and the Ravenswood City School District in East Palo Alto, CA. In what can be seen as strict academic settings, these sites are working through their own maker processes by iterating on their models of portfolio use and in turn playing a significant role in showing how portfolios and portfolio experiences exist as a key tool for assessment and learning.

## Monticello High School: School-Wide Portfolios

Nestled in the rolling hills of Charlottesville, VA, Monticello High School is a large, public, comprehensive high school within the Albemarle County Public School (ACPS) system, which serves Charlottesville's urban, suburban, and rural communities. Within Albemarle, making has gained significant momentum in the past few years, spearheaded by the efforts of superintendent Dr. Pam Moran, and ACPS continues to pave the way in showing how an entire school district can capture the spirit of making in integrated ways.

In the 2013–2014 academic year, Monticello High School took a bold step, instituting school-wide portfolios for its 9th and 10th graders. With every new year, incoming freshmen start portfolios, and soon, students at all grade levels will have digital portfolios alongside their transcripts, GPAs, and standardized test scores. Notably, Monticello is a unique place, and it became a field site for our Open Portfolio Project research because, among others, its experiences provide strong insights into how portfolios are functioning for administrators, teachers, and students alike within a standard school environment.

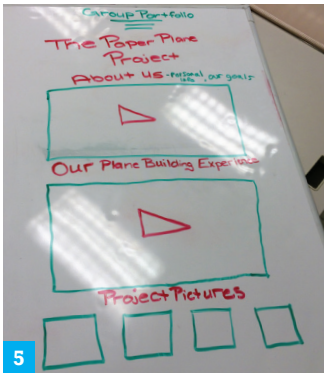
During the two-day site visit to Monticello in September 2014, it was fascinating to be back in the hubbub of a vibrant high school community, but what stood out as particularly special is the school's library and media

1


2


3


4



5

center **(2)**. It serves as a central hub for students and teachers alike, reaching the max capacity (per fire code) each and every day. The library is a soaring, open, sunlit space with high ceilings and a back wall full of windows **(3)**. There are smaller wings on both sides and a perimeter of separate rooms **(4)**. Lots of chairs, small couches, stools, desks, and low tables are scattered throughout the space. The library also houses a music recording studio, a makerspace, a hackerspace, and many other multi-use, interdisciplinary spaces where students hang out and work and where teachers often bring classes. The library, with a front help desk filled with gadgets, half-finished projects, and a 3D printer being troubleshot, is a prime space for making, but making happens throughout the school on a daily basis, whether in Monticello's official shop space, in the library, or in classrooms that range from art to computer science to cooking and math.

Monticello's portfolios are designed and developed on Google Sites, a default platform that faculty are starting to realize may be more challenging than originally anticipated. Creating pages, adding artifacts, and building menus are proving technically difficult for both students and teachers, requiring more training and support. A Google template site is provided to all students, who are allowed to customize it as they see fit. Administrators readily admit that not all staff are on board, though many teachers are excitedly thinking about the best ways in which portfolios will enable deeper learning. Individual classes at Monticello, such as Photography and Culinary Arts, have portfolios or portfolio-like practices already, and other reflection and curation practices are in place in certain subjects.

One element of our field site visits is a series of design workshops in which both students and teachers make paper airplanes while also capturing their processes **(1, previous page)**. The results and conversations afterward highlight some of the patterns we're seeing arise from portfolio work; in many places, it's clear that the product and focus shift away from being on the paper airplane and toward the video, photos, or text that document the process **(5)**. Similarly, though process is not necessarily a focus from the start, once participants start thinking about it, they begin to discuss how it may be more important than the final result.

Anecdotes from teachers and students show the successes and challenges that surround the implementation and use of portfolios. Some students wanted to think harder about what goes into their portfolios, expressing interest in planning out which work—indicative of their experiences, interests, or growth—might be best for the portfolio. Students also commented that they could see benefitting from the sharing of portfolios with peers, whether to learn from each other's processes or to use other portfolios as a standard of comparison. Some teachers also mentioned that it might be best for students to capture and archive *all* of their work. If students are making so much stuff and creating so much content for their portfolios that they can then curate what to show, that's an ideal problem to have! One particular point of Monticello's emphasis is to ensure that students have continued access to their work, whether personal or school-related.

# Lighthouse Community Charter School: Blogging and Making Across Platforms

An innovative K–12 public charter school located close to the airport in Oakland, CA, Lighthouse Community Charter School serves a largely Hispanic and low-income student population. At school, seniors stroll alongside pint-size kindergarteners, and in the past few years, one particular theme has been emerging in all K–12 curriculum, classes, and approaches: making.

Many years ago, making began at Lighthouse as part of a high school Robotics elective, taught by science teacher Aaron Vanderwerff; while his students built and programmed robots for the BotBall tournament, they also created independent projects to share at the Maker Faire. As the class evolved, Aaron began to develop a year-long plan: simple, skill-building projects (that still allowed for personalization) in the first few months, and during the second semester, self-directed projects born entirely of student interest, to be shown at Maker Faire Bay Area every May.

Since Fall 2013, making has developed into a school-wide effort, integrated into classrooms and subjects across K–12 and centered at the interdisciplinary makerspace, named the Creativity Lab. It's a colorful room of standard classroom size with walls lined with floor-to-ceiling shelves, all filled with well-organized see-through plastic bins of materials, including modeling clay, pom-poms, nets, tinker toys, fabric, markers, paint, googly eyes, resistors, DC motors, hole punches, tape, crayons, sticky notes, and puzzle pieces. Two sinks, some floor equipment (a large-format printer and vinyl cutter), a small "office" area with desks and chairs, and additional shelving that contains visual, tangible examples of student projects and works in progress, more supplies, and a growing library of educational and making books fill out the perimeter of the room. In the middle are six student tables with about four to six chairs each where students gather to make, create, and design.

The Creativity Lab program, as of September 2014, hosts four part-time educators, teaching Making electives (7th–12th grades) and in the ASP **(6)** (after-school program), and two Maker Ed AmeriCorps VISTA volunteers, who focus their efforts on behind-the-scenes coordination and implementation of making experiences within and outside of Lighthouse.


6

Maker Ed's AmeriCorps VISTA program, in partnership with the Corporation for National and Community Service, places VISTA volunteers, who commit to a year of service, in high-poverty communities around the nation to help build the capacity of a select organization. With Maker Ed, VISTA volunteers are working with organizations on professional development, outreach, communications, and development efforts, among others, all to create more opportunities for youth to make. At Lighthouse, they work with teachers to develop projects and integrate making into the curriculum of core classes (e.g., science, math, humanities, home, language, etc.), as well as create professional development opportunities for teachers in Oakland Unified and beyond. In K–4th grade classrooms, the Creativity Lab staff also work with teachers to create mini-makerspaces within their respective rooms. And the high school science and robotics classroom serves as yet another makerspace, hosting more of the woodworking and heavy-duty equipment **(7 and 8)**.

Vanderwerff and other teachers have been actively thinking and experimenting with documentation over the past three to four years, whether through developing project guides for others to use or promoting student documentation in preparation for Maker Faire. Students who head to Maker Faire Bay Area have created posters


7


8

of their projects in order to highlight their work and processes, and art teachers have set aside time in class, allowing their K–6 students to curate a portfolio of their individual pieces. In the summer of 2014, the team experimented with a simple documentation station that took center stage in the Creativity Lab, in order to capture what summer students were creating. The high school Making electives kept a Tumblr blog, where posts were often prompted by simple direction: Take a picture of your project in its current state, and write about what you did in the past week." The tagline of the blog? "Lots of people making lots of stuff."

As Lighthouse continues to integrate making into its students' everyday learning, it's obvious that making takes many different forms and styles. As such, documentation and portfolios do, too. One particular student—who might be found hiding from math class to make stuff instead—is in the midst of creating a laser harp, a project she started last academic year. When describing her ongoing harp project, she says that instead of using regular strings, "I use lasers." They're implanted through the bottom of the harp, and photodetectors are added at the top; when a player crosses his or her hands through the lasers, the lasers are disrupted and the harp plays a sound. She does not write much in the class blog, but she actively uses her notebook, sketching in it and organizing it in a way that helps her easily locate the information she needs (like measurements). Why does she not blog? She answers, "It's not about not liking technology or blogs; I like to have it on-hand." This example helps us better understand the inclinations and tendencies of students in their documentation practices, maybe even preferences for tangible objects, as well as the challenges facing the creation of digital portfolios. In this instance, we see how portfolios can serve different purposes; some are created for oneself (e.g., organizing, sketching), and some are created for others (e.g., showcasing, sharing).

At Lighthouse, this documentation is leveraged when students advance from one grade grouping to the next (every two grade levels). At these stages, students undergo a review of their work in a "Passage Presentation" with teachers and parents, showcasing a portfolio of "big projects" that are kept in a binder and passed between teachers. In thinking about making, this set of passage milestones may be the perfect opportunity for capturing even more student work.

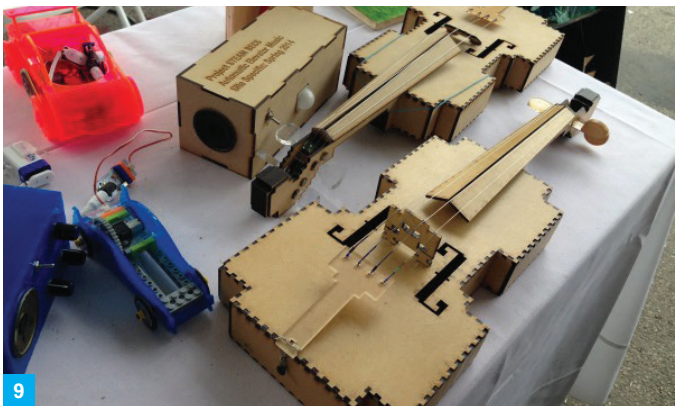
## Marymount Fab Lab: Portfolios of Practices

The Marymount Fab Lab, one of four highly equipped makerspaces at Marymount School of New York, an all-girls K–12 private school, is one of 10 field sites the Open Portfolio Project core team visited as part of our efforts to learn about the portfolio and documentation practices of youth makerspaces. Technology Integrator and Fab Lab Administrator Jaymes Dec kindly agreed to an extended virtual visit in November 2014 through a video call with our team, telling us more about the Fab Lab, an open studio space for young female makers to explore, invent, and design projects based on their personal interests. Math and science classes are also occasionally held at the space. During our video call, Dec also gave us a tour of the space and talked to us about ongoing documentation practices.

The Marymount Fab Lab is a workshop space filled with state-of-the-art 3D printers, an embroidery machine, a laser cutter, a milling machine, electronic materials and toolkits, and a walk-in closet full of grab-and-go consumables from fabric scraps and cardboard to take-apart computers and monitors. One of the shelves in the Marymount Fab Lab is dedicated to a treasury of physics and computational gadgets, such as conductive ink, acquired by backing Kickstarter projects, for the young makers to tinker with. Beneath a workbench that spans a wall are many transparent boxes that contain glue sticks, popsicle sticks, pipe cleaners, Arduino boards, and much more. The boxes are labeled with calls for action, such as "decorate something," "hold things together," and "invent something."

The Fab Lab's vinyl cutter is actually located in the digital visualization lab of the school, a wide, open space mainly used for meetings around works in progress and exhibitions of past projects, expanding maker practices outside the Fab Lab. Much of the visual documentation of the Fab Lab is also situated in the digital visualization lab. Wall-mounted screens show professional-quality photographs of past projects, and shelf space is reserved for young makers to store projects in progress, visible to anyone with access to the school **(9)**.

In the Fab Lab, during open studio classes, Dec takes photographs of the young makers at work using a semi-professional SLR camera. The camera is equipped with a wi-fi-enabled SD card that transfers the pictures to a computer and organizes them into a folder, automating one technical aspect that might hamper documentation practices. Currently, the photographs are mainly used for external communication, but there are future plans to give students access to the folder as well.


9


10

Apart from visible documentation outside the Fab Lab, the lab itself also includes posters of small group work, updated as projects progress. The idea is that the posters grow as the work develops, documenting students' challenges, turning points, and decisions as they work on their projects. At the end of the school year, students are asked to present their work (either prototypes or documentation) to a jury of upper-level students and faculty, to articulate their problem statement, encountered challenges, how the challenges were addressed, and where they plan to take this work. Separate from the juried presentation, documentation is frequently used for assessment. Videos and pictures stand as proof that the students of the group really did the work, that it worked and satisfied the challenge, and that student teams collaborated.

Similar to the space, documentation practices are a work in progress for the Marymount educators. During our video call, Dec mentioned that he would love to see every student carefully study their mistakes through documentation in order to become more aware of their practices. Additionally, through documentation, every student could develop a portfolio in preparation for college and professional applications to set themselves apart from other applicants.

As making and makerspaces—including highly equipped spaces such as the Marymount Fab Lab—are increasing in schools, the importance of understanding how to leverage excellent portfolio practices across spaces is increasing. The virtual visit at Marymount presents excellent examples of how schools are starting to move toward making without compromising on student interests. We see that open portfolios play a role in this, for example, through shaping assessment practices and automating aspects of documentation to support smooth connections between making and portfolio creation, setting students up for academic and professional success beyond school.

## Ravenswood: Makerspaces District-Wide

The Ravenswood City School District, just north of Silicon Valley, CA, serves a predominantly Hispanic population in East Palo Alto and surrounding neighborhoods. Over the last two years, Robert Pronovost, the Lead STEM (science, technology, engineering, and math) Coordinator, has spearheaded an enormous effort to design, build, and establish seven makerspaces in schools throughout the entire district. His personal passion, making mixed with coding and robotics, form the basis of the activities in the makerspaces, many of which are in varying stages of completion. One, located in a mobile classroom at the Los Robles Dual Immersion Magnet Academy, is up and running—and thriving **(10)**.

Currently, the hope—in addition to having a space at every school—is to have enough funding to allow the makerspaces to be open to the community, with dedicated facilitators at each site to welcome not only students but parents as well. The open day in 2013 was well-attended by parents, and they experienced first-hand the excitement that emanated from kids and adults. The Ravenswood makerspaces are also looking to integrate with curriculum and existing classes, whether science, social studies, or language arts. There's also potential for an "Introduction to STEM" course for 4th and 5th graders, led by a certified teacher who is also well-versed in and excited to facilitate making experiences.

In addition to the building of physical space, documentation of making is a close second in priority. The coordinators at Los Robles explain that documentation helps youth see what's possible. It provides students with examples of projects by peers, and it showcases the successes as well as the processes—all of which require perseverance, development of skills, and problem solving. Project samples allow others in the greater community to glimpse what's happening in school and provide a spark for students to start making things for themselves. On another level, documentation is a clear assessment of student learning. It provides evidence of whether the makerspace supports student development, and it feeds back into the cycle of self-improvement with information on what works and what does not. It also provides, quite simply, data for topics like material popularity. Documentation allows coordinators to better understand which materials should be kept in stock.

The makerspace at Los Robles contains snippets of documentation in all corners. Students who log into Tinkercad use a group account for the makerspace, allowing students to easily see each other's work. On one shelf with multiple bins of projects is a digital photo frame that rotates through photos of projects


11

and youth. In another corner of the room is a glass display of 3D-printed objects **(11)**, all by students, near the 3D printer. Buckets with projects in progress sit on shelves all along the wall, and near the back corner is an example of a simple Makedo house, inspiring kids to build their own out of the pile of cardboard nearby. On tables in the middle of the room are also project examples, some being actively developed by staff and some being tinkered on by students. As part of a unit on green energy, a small-scale wind turbine sits on the edge of the table, facing a large box fan, ready to generate power. Up front, a project binder is filled with individual pages of student writing and drawings, some with a simple jotted idea or goal and others with writing and reflections on every stage of work. That binder is the initial, informal step towards portfolio creation.

Students initially came to the makerspace during recess and lunch. With growing demand, the makerspace began to stay open to classes outside of lunch. Students who hesitantly joined in last year are now leading and helping others; they are already familiar with tools and thinking about future projects. Students come to the makerspace to learn Tinkercad, work on projects, collaborate with others, and even focus on homework. With digital cameras that are wi-fi-enabled, facilitators record the action via video and photo, and coordinators are thinking about how they will have students share their work from one makerspace to another, connecting all of the district sites. Pronovost mentions that he'd like to eventually have ID cards for all students, each card containing data on what skills they've mastered and what interests they have. Students will be able to support peers through their own expertise and experiences.

There is a unique opportunity brewing at Ravenswood: the community of makers and makerspaces being built will develop organically to fit the needs of the specific school and youth, and their connections to one another will allow for easy sharing and demonstration. Each makerspace will both reflect and showcase the passions of its individual audiences. In turn, the portfolios created—whether representing the individual or a group identity—will do the same: they will be an ever-growing collection of physical and digital artifacts that capture the facets of what youth and educators are doing.

## Commonalities Across In-School Portfolios

There were several commonalities that emerged across our in-school site visits, including portfolio practices that (a) integrated making and instituted portfolios across grade levels and subject matters; (b) leveraged the rich collection of artifacts as evidence of learning through making, as a seed to continue the spread of making into other spaces and with other teachers; and (c) seamlessly designed documentation and the capture of work as part of the process of making. Some significant challenges still exist too, and sites are addressing them steadily, learning from one another's findings. They continue to try and test digital tools and platforms, such as blogging sites, to determine which are most easily adopted by schools and adapted to teacher and student needs. Engaging with a broad range of teachers to think through how portfolios can be effectively utilized in their classrooms and in conjunction with their teaching norms is also a work in progress. These commonalities are particularly salient within in-school environments and, as seen in the next research brief, are addressed in different ways in out-of-school settings as well.

At all of the field sites described in this brief, one particular insight continued to stand out: the need for portfolio development to simply be an ingrained part of the making process instead of standing apart as an addendum.

Field sites are exemplifying this need (and its solution) in multifaceted ways. When educators set the stage by establishing expectations and creating time to capture photos and video, reflect, and share, youth will do just that. And in the process, their focus on making expands beyond just the product or project itself; it grows to encapsulate their efforts on both the making and the documentation.

## Acknowledgements

*The work of Maker Ed's Open Portfolio Project is made possible by generous support from the Gordon and Betty Moore Foundation. We also thank the members of the National Working Group, who provided constructive comments and valuable insights to our work.*