COLLABORATING TO TRANSFORM TEACHING AND LEARNING

Shirley Simmons
ssimmons61@gmail.com

Lee Nelson
lnelson@norman.k12.ok.us

Kathryn Roots Lewis
katlewis25@gmail.com

Teresa Lansford
lansfordslines@gmail.com

Martha Pangburn
mpangburn@norman.k12.ok.us

Chloe Summers
csummers@norman.k12.ok.us

Lauren Schrank Patterson
laurens@norman.k12.ok.us

What do animals' whiskers, litter on school grounds, and the parabolic shape of lenses have in common? They were all subjects for learner-designed inquiry projects guided by educator and school librarian collaborations. Since 2015, educators in the Norman Public Schools have integrated Guided Inquiry Design (GID) (<www.guidedinquirydesign.com>) into the standards-based curriculum, and in 2016 making was incorporated into the open-ended process. Instructional team and learner collaboration play an essential role in both GID and making. Infusing the GID + making approach into the curriculum creates a culture where collaboration and learner voice and choice are championed.

Carol Kuhlthau's Information Search Process (ISP) research model (2004) provides the theoretical framework for GID when designing inquiry for pre-K through 12th-grade curriculum. The GID process has eight phases: Open, Immerse, Explore, Identify, Gather, Create, Share, and Evaluate (Kuhlthau, Maniotes, and Caspari 2015). In GID learners are immersed in content and select a personally relevant and interesting question to research, design, collaborate, build, and share a learning product with others. Collaboration between classroom educators, school librarians, resource specialists, and other experts provides the supportive environment in this iterative and somewhat messy process.

For more information about GID + making, visit <https://www.normanpublicschools.org/Page/3138>.

Norman Public Schools received an Institute of Museum and Library Services National Leadership Grant for Libraries for a three-year research project. Research partners included Dr. Kyungwon Koh, principal investigator and associate professor in the School of Information Sciences at the University of Illinois, and Dr. Xun Ge, co-principal investigator and professor in the Instructional Psychology and Technology Department of Educational Psychology, Jeannine Rainbolt College of Education, University of Oklahoma. The grant, titled "Learning in Libraries: Guided Inquiry Making and Learning," was funded in 2016 and included an elementary, middle, and high school in the Norman Public School district and more than 400 learners. Educators and school librarians at the three schools collaborated to implement the GID process and making into instruction. This research project broadened current knowledge on how learning occurs when combining an inquiry pedagogy with making in school libraries as part of the regular school curriculum.

Additionally the GID + making approach applies the Shared Foundations and Competencies from AASL's *National School Library Standards*. The two Shared Foundations most recognizable are Inquire and Explore; yet it is Collaborate that played the most pivotal role, affording learners the ability to participate in conversations, work together, demonstrate empathy for others' perspectives, and be inclusive, respectful, and reflective in the learning community. Collaboration among the learning team and with our learners was paramount in the successful adoption and use of the GID + making approach.

Elementary School: Adaptation, Survival, and Inquiry Circles

"Why do animals have whiskers?" asks a first-grader. This learner was curious about land and sea animals that have whiskers and wondered how

whiskers could help those animals survive in their environments. By participating in an inquiry circle with learners who had similar interests, this young girl received targeted support and instruction. The end product of her research project, a collection of clay creations, allowed her to share information with her peers while exhibiting confidence and enthusiasm, demonstrating growth in oral language skills and fielding peers' questions with grace.

Lincoln Elementary School's first-grade teachers selected the science standard of animal adaptation and survival for their inquiry unit. The standard included how parents interact with their offspring, characteristics of animals that aid their survival, and how animals interact with the environment. The learning team for this inquiry unit included classroom educators, the school librarian, a gifted resource coordinator, and a reading specialist.

After learners formulated their own inquiry questions, the learning team met to review the learners' questions, group learners into inquiry circles for those with shared interests related to the overarching concept, and select a group to facilitate. Inquiry circles are fluid groups of learners organized to meet student needs. Grouping learners into inquiry circles enables students to work as a team to help one another find answers to their questions. Because they have shared interests, learners are invested in one another's questions.

While guiding a group using instructional resources, each learning team member embedded mini-lessons on keywords, nonfiction text features, skimming, and scanning, while modeling how to search for answers. A classroom educator on the team stated, "When managed efficiently, inquiry circles can create an environment where all kids feel respected and all voices are heard. It is an opportunity for our students to reflect on their learning on a deeper level. I have witnessed many conversations between peers where perspectives are exchanged and meaningful discoveries are made" (Lincoln Elementary School First-Grade Teacher 2020).

After the majority of learners found answers to their questions, they were regrouped based on their progress within the process. The gifted resource teacher, reading interventionist, and special education teacher helped students who needed additional support gather information. The classroom educators worked with learners to formulate a plan for creating a product to show their learning, while the school librarian worked with students who had already developed plans and were ready to create.

Grouping learners into inquiry circles enables students to work as a team to help one another find answers to their questions.

Why do animals have whiskers? First-grade learner's clay examples of animals with whiskers.

The learning team collaborated both formally in planning meetings and informally through hallway discussions or e-mail throughout the process to determine how to meet learner needs. All members of the instructional team needed to be flexible regarding the groups and the various stages in the process they would facilitate. Our classroom educators understood that as learners' needs shift so will their roles in the process.

At this point, our first-grade learner with an interest in whiskers moved from the classroom educator's group (gathering information) to the school librarian's group to begin the making process. Through her research, she discovered that animal whiskers can aid in an animal's survival in two ways: by understanding how they can fit through spaces on land, or by sensing currents in the water to determine whether approaching animals are possible predators or prey. To share this learning she created air-dry clay examples of the animals along with props to show how animals use their whiskers for survival.

Middle School: Renewable Resources, Sustainability, and Inquiry Journals

"How does everyday littering affect the environment, and what can be done to reduce waste?" asked one 8th-grade learner. At Longfellow Middle School, a learning team of two science classroom educators, the school librarian, and the gifted resource coordinator collaborated to implement a science unit on the concept of sustainability. The unit's goals were to help learners understand their part in environmental sustainability and the characteristics of renewable and non-renewable resources. Students developed and researched a personally interesting inquiry question, then synthesized their research to create a product, and shared what they learned using the school library's makerspace.

Throughout the unit, learners used digital inquiry journals, which allow for interactive educator, school librarian, and learner collaboration. These shared hyperdoc templates were developed by the school librarian and classroom educators and allowed all members of the learning team to view the thoughts and questions of the learners at various points during the unit. As learners gathered and cited sources, took notes, responded to prompts, and reflected on their learning, they noted the information in the inquiry journals, allowing the team to collaboratively evaluate the progress learners are making and providing a mechanism for specific individual feedback.

The learner whose project is depicted on page 24 was interested in the impact of everyday littering and what can be done to reduce waste. She decided to collect trash around the school, gathering more than 300 pieces of trash in the first two days. To share and document her findings, she created an animated video accompanied by charts and graphs. Her video was designed as a public service announcement and included suggestions for reducing littering.

High School: Quadratic Functions, Parabolas, and Conferencing

Why did the Algebra II learning team begin a unit by having learners compete in a ring toss game, squirt a water gun, and launch objects with a catapult? At Norman High School the school librarians and Algebra II teachers collaborated on an inquiry unit focused on parabolas. The goal of the unit was for learners to find a real-world quadratic equation, write the equation of this function, solve their equation using at least two different methods, and research quadratic functions in relation to their usefulness in everyday life. As part of the GID + making process, learners explored and investigated parabolas in everyday life, constructed a research question, completed academic research using reliable Internet sources and academic texts, and synthesized their research to create a product that illustrated the usefulness and real-world application of quadratic functions using makerspace tools.

Download a template of an inquiry journal and other GID + making resources at <https://www.normanpublicschools.org/Page/3150>.

One high school student built a working telescope to demonstrate how the parabola of a lens affects sight. After focused conferences with

How does everyday littering affect the environment and what can be done to reduce waste? Middle school learner's video documenting her findings regarding littering and its effects.

"Right now you probably think there's no point to doing anything since it won't make a difference. But it will! If just five people stop littering and clean up their messes then maybe it'll inspire their friends to do it too! It's not even that hard! Just throw away your own trash in the nearest trash can. Also reusing school supplies can be very helpful!" (8th-Grade Student's Inquiry Journal 2018).

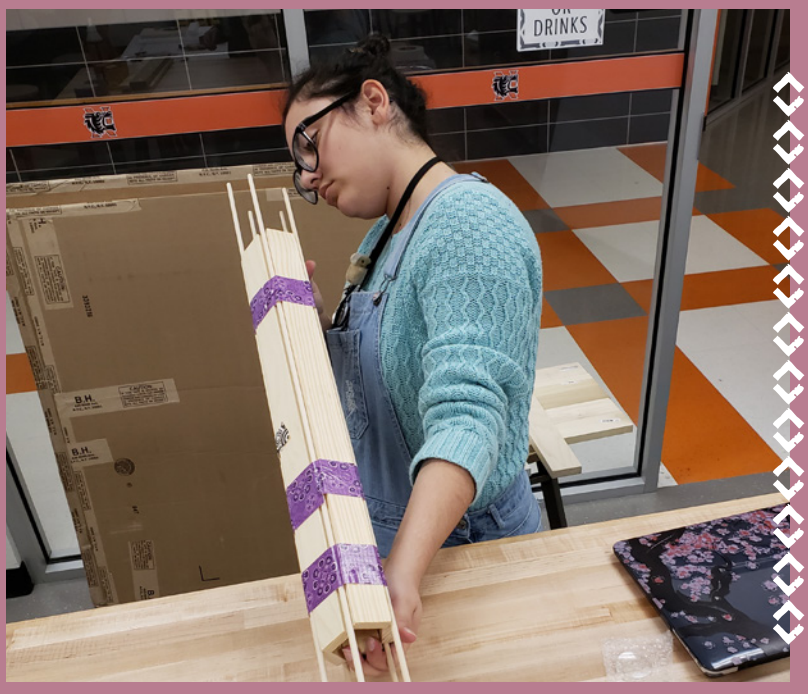
members of the learning team, her inquiry question, "How does your vision change when you completely change the parabola of your eye lens?" evolved to "How does changing the parabolic shape of a telescope lens affect how well and far you can see?" Conferencing helped the learner realize she was most personally interested in telescopes, and she adjusted her question to connect her own interests to the inquiry concept.

Conferencing is a strategy that works most effectively when it is a shared responsibility between all educators on the team. At several points during the inquiry process members of the learning team met individually with learners to probe their thinking, discover problems and misconceptions, and offer specific and personalized feedback. Team members collaborated with a small number of learners based on the students' needs and the educators' strengths. Conferencing is a fluid process that allows team members to refer a student to other experts on the team, offering the learner more than one expert's perspective.

In addition to conferencing during the inquiry question development phase, conferencing was used while learners gathered information, affording the team the luxury of providing individualized information literacy instruction. During the making phase, the use of a project proposal Google Form and conferencing helped learners seek assistance and manage their time. Conferencing provides a model for learner peer coaching, which, with appropriate scaffolding, offers valuable insight and supports learners.

Our high school learner's telescope demonstrated her new understanding of how lenses use parabolas to function. During a conference, she shared her frustration over inserting the lens incorrectly in her telescope, which caused the telescope to not work properly. This piqued her curiosity, so she dug deeper, and in her further research she discovered that a similar problem occurred with the Hubble Telescope. Upon reflection, the learner said:

> I learned that parabolas are a big part of the real world. I think this is important because it allows me to be able to see that the things I learn in class are actually important and relate to the real world. I also learned that a hands-on learning experience was a better learning environment for me. I improved my comprehension skills and ability to bring an idea to life. I was also more engaged in what I was doing and it became more serious than everyday work. I also had to work on my time management skills to help me achieve my goal. (High School Student's Inquiry Journal 2018)



How does changing the parabolic shape of a telescope lens affect how well and far you can see? High school learner examines her telescope.

Outcomes of Collaboration in GID + Making

Effective collaboration can be a tool for breaking down silos and building a culture of deep and relevant learning. As a part of a team, educators support each other in risk-taking, giving each other permission to fail, try again, and improve their practice. Being familiar with learners' inquiry questions allows those educators who work directly with students to personalize, challenge, and extend their instruction beyond the GID + making process. The iterative, collaborative process provides learners with not only deeper, personally valued, connected, and more reflective learning, but also ownership, confidence, and an improved attitude toward school, libraries, and education in general. This is a synergistic relationship—a positive feedback cycle—that gradually transforms school culture. A school culture where the Shared Foundations—Inquire, Include, Collaborate, Curate, Explore, and Engage—are seamlessly woven into the GID + making process transforms the learning experience for learners and educators alike.

Conferencing provides a model for learner peer coaching, which, with appropriate scaffolding, offers valuable insight and supports learners.

One high school classroom educator shared: "...you don't have to be an expert in everything. Collaborate with the people in your building, in your district that can help you.... You can bring in your [school] librarians and you can collaborate and make something wonderful. You're not just on an island by yourself." (High School Math Teacher 2019)

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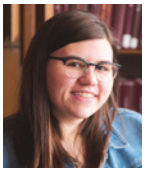
Kathryn Roots Lewis *is the retired Norman (OK) Public Schools director of libraries and instructional technology. She was the director of the IMLS grant project and is past president of AASL. She authored the article "Making It Matter: National School Library Standards for School Administrators" in the May/June 2019 issue of* Knowledge Quest.

Dr. Lee Nelson *is the Norman (OK) Public Schools technology integration specialist. She was co-director of the IMLS grant project.*

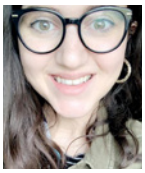
Dr. Shirley Simmons *is former assistant superintendent of educational services in Norman (OK) Public Schools. She was co-director of the IMLS grant project. She was the recipient of the 2019 AASL Distinguished School Administrator Award. She coauthored the article "Building a Culture for Learner Voice and Choice through Inquiry" for the April 2018 issue of* Teacher Librarian.

Teresa Lansford *was the school librarian for Lincoln Elementary School (Norman, OK). She is a National Board Certified Teacher. She was a 2019 Oklahoma Teacher of the Year finalist and a finalist for the 2020 Oklahoma Medal for Excellence in Elementary Teaching. She was a member of the IMLS grant team. She wrote the article "TEAM Players: Making a Culture of Inquiry" in the May 2019 issue of* School Library Connection.

Martha Pangburn *is a school librarian for Norman High School (OK). She was the 2020 recipient of the Oklahoma School Librarians Polly Clarke Award. She serves as the chair for the AASL Frances Henne Award Committeer. She was a member of the IMLS grant team.*



Lauren Schrank Patterson *is school librarian for Longfellow Middle School (Norman, OK). She served as graduate assistant during the IMLS grant.*



Chloe Summers *is school librarian for Norman High School (OK). She served as graduate assistant during the IMLS grant. After accepting a position as school librarian, she was a member of the IMLS grant team.*

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