

Teaching the Inquiry Process to 21st Century Learners

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ALAS, OLD RESEARCH, WE KNEW YOU WELL.

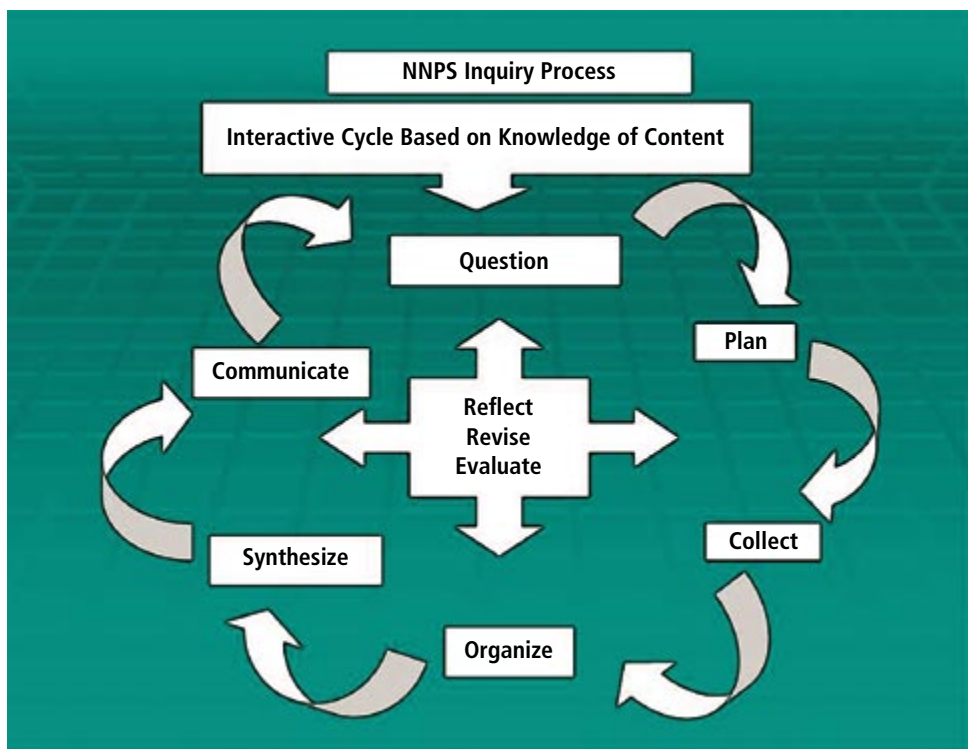
The old, outdated research project long carried out in school libraries everywhere has finally breathed its last breath, and teacher-librarians are happily celebrating its timely demise. In fact, we are not even casting so much as a fond glance back at the piles of index cards or slowly sliding a finger lovingly along the reference stacks. We have discovered a new love in the versatile and adaptable replacement for the tired old research project—the Inquiry Process. Unlike the static, set-in-stone research project, the inquiry process is an interactive cycle used to teach research in any content area. The inquiry process engages students in a way that promotes critical thinking, higher-level processing, and the use of more varied and appropriate resources. And if that's not enough reason to teach the inquiry process, consider the fact that students are learning a process of gathering evidence to solve problems or answer questions that they can use throughout life, as opposed to finding and regurgitating a set of facts they will never need again.

THERE ARE MANY ADVANTAGES TO TEACHING THE INQUIRY PROCESS.

The inquiry process encourages cooperative learning in settings where the final outcome is a group effort with everyone benefiting from the learning experience. Integrated learning is also possible because the inquiry process can take one project through all of the major content areas. A project on water pollution can begin with the science class investigating the environmental effects of water pollution, and then move on to the social studies class where students can look at laws regulating pollution. The pollution project can then continue with the math class calculating and graphing the monetary damage caused by pollution, and end with the English class writing up the results. The inquiry process allows teacher-librarians to work with students with different learning styles in that answers to questions can be found in print materials and audiovisual online resources, with the final project being a hands-on creation. The process is multiple-intelligence friendly as well. Visual/spatial and verbal/linguistic learners are comfortable searching through the print resources, while the logical/mathematical learners relate to the problem-solving basis of the inquiry process.

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FIGURE 1: The NNPS Inquiry Process



The interpersonal and intrapersonal learners are especially good at evaluating online resources, while the kinesthetic learners will be best at navigating around the media center to find the various resources. The process encourages students to work together and allows for the realization that there can be more than one way of solving a problem or question. Finally, the process comes to a conclusion with the communication and presentation of results. Each step requires students to review what they have just done for accuracy and totality. Final projects can take on a variety of forms that can be negotiated between the teacher and the student. Perhaps the greatest advantage is that the inquiry process utilizes the Bloom's lower level skills of knowledge, comprehension, and application in the first two steps of the process, but relies more heavily on the higher level

processes of analysis, synthesis, and evaluation in the remaining steps and during the review cycles. On the surface, it appears the inquiry process is the perfect learning tool. Teacher-librarians may wonder, “Can anything make the inquiry process even more perfect?” The answer to that question is a resounding “YES,” when it is combined with 21st century teaching tools.

INTRODUCE TECHNOLOGY TO THE INQUIRY PROCESS.

The inquiry process model used by Newport News Public Schools (see Figure 1) shows a cyclical process that begins with questioning, and then moves on to planning, collecting information, organizing the information, synthesizing the information into a final form, and communicating results to a teacher or peers. At each step in the

process, students reflect, revise, and evaluate the work accomplished and either continue forward, or repeat the step until complete. BT (before technology), students might have begun the process by brainstorming ideas on a chalkboard or white board. With the technological resources available today, it makes more sense to begin the inquiry process with a Web quest.

Web quests are great tools for guiding students through the inquiry process. Using a Web quest helps students narrow down a broad topic and learn the content at the same time. Teacher-librarians can create their own Web quests using a bookmarking site like PortaPortal (www.portaportal.com/) or a Web quest creation tool such as TeacherTap (<http://eduscapes.com/tap/topic4.htm>). Content specific Web quests are also available from WebQuest.Org (<http://webquest.sdsu.edu>), teAchnology (www.teach-nology.com/teachers/lesson_plans/computing/web_quests), or from a Web quest rating site such as Best WebQuests (<http://bestwebquests.com/>).

After mastering Web quests, students are ready for the more open-ended project in a Web-based inquiry. Web-based inquiry projects require more outside research than a Web quest, and teachers can view and monitor student participation in Web-based inquiry projects using free sites such as the Web-Based Inquiry Science Environment (<http://wise.berkeley.edu/>) or student projects from the University of Richmond Education Department (<http://oncampus.richmond.edu/academics/education/projects/>).

TEACHING THE PROCESS BEGINS WITH STEP 1: QUESTIONING.

Once students have narrowed down their topic through a Web quest or Web-based inquiry, they are ready to create questions on the topic, which they will use the remaining steps of the inquiry process to answer. The first step is to determine what is already known about the topic. From there, students will easily be able to create a list of questions to discover what they need to know about their topic. Most students create yes/no questions such as “Is the water in our lake polluted?” or “Does a change in light source affect the way a plant grows?” Encourage students to write open-ended questions by having them write who, what, when, where, why, or how questions. The yes/no questions on pollution and plant

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light become open-ended questions if rewritten as “What caused the water in our lake to become polluted?” or “How does a change in light source affect the way a plant grows?” Exploratree by FutureLab (www.exploratree.org.uk/) contains blank thinking guides that students can use to plan out the question phase of the process. The blank guides featured in the *Explore* and *Solve Problems* sections of the *Ready-Made Thinking Guides* are particularly adaptable to the first step of the inquiry process. Once students review and revise their questions, they are ready for the planning stage of the process.

WITH QUESTIONS IN HAND, IT IS ON TO STEP 2: PLANNING.

Students should create a preliminary work schedule for completing the project on time, beginning by looking at other student projects on ThinkQuest (www.thinkquest.org/en/). Enrolling is free, but if your school is not a member, students can still click on the “Library” tab, and view a number of award-winning student and teacher generated projects to get an idea of how to plan their own inquiry. Another good site for planning is Think Tank (<http://thinktank.4teachers.org/>). Think Tank allows students to “create an outline of topics and subtopics to assist research” and to “narrow their research topic so it becomes more specific.” Even better, students who use Think Tank to plan their project can use the plan with another ALTEC product called NoteStar in the collect and credit phase of the process.

Now comes the time of the inquiry process that teacher-librarians live for—helping students find the resources to answer the questions they created in step 1. We know that students avoid print material like cockroaches avoid light, but we

can lure them back into stacks by incorporating electronic materials into the collection. The Thomas-Gale Publishing Company’s U-X-L encyclopedia series features a variety of reference resources that come in both print and e-book format. Encourage the students to use print form while in the media center, and finish with the e-book format in the classroom or from home. Most school systems also subscribe to reliable online sources such as Grolier Online Passport, World Book Online, and Big Chalk/Electric Library. Of course, there will always be students (and teachers) who feel that everything-you-ever-wanted-to-know-about-everything can be found using Google, but savvy teacher-librarians can change that way of thinking using the Web site evaluation resources available on Discovery School’s Kathy Schrock’s Guide for Educators. Once students create a plan for completing their inquiry project, with resources included, then review and revise their plan, it is on to the collecting and crediting phase of the inquiry process.

ARMED WITH QUESTIONS AND A PLAN, IT’S TIME FOR STEP 3: COLLECTING AND CREDITING.

Helping students with the collecting and crediting phase is certainly right up there with the smell of new books, chocolate anything, and snow days. With their lovely, librarian-approved sources in hand, students begin collecting and documenting information. NoteStar (<http://notestar.4teachers.org/>) helps students take and organize notes, while keeping track of source information. Many teacher-librarians still maintain MLA format worksheets for teaching students how to document sources on which a student fills in the appropriate information, and voilà—instant MLA format citation for the bibliography page. Digital natives don’t care much for paper, though,

FIGURE 2: The Six Step Process

STEP #	THE PROCESS	MANAGING THE PROCESS
Preliminary	Identify & Focus on a Topic	Select a Curricular Sub-topic
1	Questioning	Brainstorm using online library of interactive thinking guides such as www.exploratree.org.uk/ What do you already know about the topic? What questions do you need to answer about the topic? Use the question stems to get started: WHO • WHAT • WHEN • WHERE • WHY
2	Planning	Create a Plan 1. Revise questions and plan as necessary 2. Determine the resources you can use 3. Evaluate your sources: Begin a work schedule Use email and message boards to contact teacher, librarian, and study partners with questions
3	Collecting and Crediting	Use CD ROMs and library facilities Students collect data from previewed URLs on the Internet Students use emails for collaboration and data gathering Students maintain digital portfolios to hold information Record your sources
4	Organizing	Revise questions and plan as necessary Organize data into a diagram Analyze Data – Identify missing or controversial data, draw conclusions Phone or email an expert to clarify, verify and / or fill in gaps
5	Synthesizing identifying themes forming conclusion developing insight into the problem	Determine one of the following formats for final product: Multimedia presentation Speech Report Word process document PowerPoint presentation Web Page / Blog · Evaluate your product using the product rubric · Determine the shape of product · Determine the content of product
6	Communicating	Communicate information to your audience Evaluate · Students will use product rubric to aid in self evaluation and / or · Teacher evaluates · Set new goals

so resources like Carmum www.carmun.com/ and EasyBib bibliography creator <http://easybib.com/> are their preferred medium. Both are easy to use and free. Keeping with the digital native's paper avoidance mode, teacher-librarians can easily steer students toward the paperless project by introducing them to digital portfolios in the synthesizing phase of the process. Because so many of our students have a hard time taking notes in their own words and giving credit where credit is due, review avoiding plagiarism. Indiana Public Schools sponsors a resource for detecting and avoiding plagiarism located at <http://indiana.edu/%7Ewts/pamphlets/plagiarism/shtml>. After students review and revise their notes and bibliography, it is then time to organize notes into a form that can easily be translated into the rough and final draft project.

FINDING A PLACE FOR EVERYTHING TAKES PLACE IN STEP 4: ORGANIZING.

Paul Wellston said, "Successful organizing is based on the recognition that people get organized because they, too, have a vision" (BrainyQuote.com). To progress in the inquiry process, teacher-librarians will have to get their students to buy into the concept of organizing their notes. This one step allows students to figure out whether they are missing information critical to the completion of their project and to make sure they can reach a conclusion. Technology oriented students who used NoteStar will already have their notes in a well-organized format, but students may want to use graphic organizers as an additional resource in organizing. TeAchnology members www.teachnology.com/web_tools/graphic_org/ can access blank graphic organizers that can be modeled for students. ReadWriteThink http://interactives.mped.org/view_interactive.aspx?id=127&title= has an interactive webbing tool that students can use to graphically organize their notes. If the inquiry project is destined to become a final product that is meant to persuade the audience toward a specific conclusion, then students may use the persuasion map feature on ReadWriteThink.com www.readwritethink.org/map/materials/persuasion. Nearing the end of the inquiry process, students should review and revise their now organized notes before proceeding to the next step.

COMPLETING THE PROJECT IS STEP 5: SYNTHESIZING.

Here is the place where a teacher-librarian can truly spread his or her techno-wings and fly circles around the media center. Digital native students are so over the traditional research paper even though English teachers still cling to that lifeline like a passenger from the *Titanic*. Teachers who still want us to assist students in writing a paper should check out sources like Angelfire.com www.angelfire.com/wi/writingprocess/ and InfoPlease.com www.infoplease.com/homework/writingskills1.html.

Students may eventually approach the final outcome to the inquiry process with excitement instead of dread. Multimedia or Microsoft PowerPoint presentations once considered cutting edge are second rate compared to the digital portfolios, Web pages, and blogs that are more suited to the digital native. For students who still want to prepare their final project using Microsoft PowerPoint, George Mason University <http://mason.gmu.edu/~montecin/powerpoint.html> has an excellent Web site on *Creating an Effective PowerPoint*. Writers' Window <http://english.unitecology.ac.nz/writers/home.html> is a blog where writers between ages 5-18 can share their writing with others. Sponsored by the New Zealand Ministry of Education, this site is free, kid-friendly, and secure in that the organization will not publish any writing that compromises the privacy of the authors. Teacher-librarians can also set up a free blog through 21Classes Cooperative Learning www.21classes.com/. ThinkQuest www.thinkquest.org/en/ allows students from member schools with a user ID and password to create and post their projects online to share with others. Students can also consider creating a digital portfolio/public performance project. Tech Trainer www.etc.net/tech/tips/portfolios.htm explains digital portfolios and gives step-by-step instructions to create portfolios. Student portfolios can then be displayed on school Web sites with the help of the Web master. Digital portfolios created by students from Discovery Middle School make good examples <http://longwood.cs.ucf.edu/~MidLink/portfolios.dms.html>. After reviewing and revising the final product, students will be ready to complete the last step of the process—presenting the project to others.

THE FINAL FRONTIER—PRESENTING THE RESULT OF THE INQUIRY IN STEP 6: COMMUNICATING.

While students usually "present" the results of their inquiry simply by turning the project in to the teacher, breathing a sigh of relief, and then forgetting about it completely, teachers are beginning to change the process of the final presentation. Teacher-librarians can assist students who have to make oral presentations by directing them to Web sites containing tip sheets and suggestions for making oral presentations. InfoPlease www.infoplease.com/homework/oralreport1.html offers a check list on making presentations as does Sharon Sutton's 21st Century Literacies site www.kn.pacbell.com/wired/21stcent/presenttips.html. Richard Laing's tip sheet http://dcc2.bumc.bu.edu/prdu/Session_Guides/oral_presentation_techniques.htm on oral presentations includes an evaluation checklist.

AND SO OUR INQUIRY ADVENTURE COMES TO AN END.

With the old research project having come to a quiet end, and the inquiry process coming into its own, students now have a more modern means of discovery that lends itself to every single discipline. Students must be proficient in inquiry skills to be successful in life beyond the academic years. Technology is not only requisite in teaching today's digital native students, but is the preferred means for the teacher-librarian in guiding students through the inquiry process. Students already have a high interest level in the Web, so we must capitalize on that interest to engage them in the content we want them to learn. 🌈



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