Handouts for

Designing Projects Students (and Teachers) Love

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These handouts can be downloaded from
<www.doug-johnson.com/presentations>

Designing Research Projects that Kids (and Teachers) Love

Great research projects not only teach important information literacy skills but also:

- make school more meaningful for all students,
- help students develop higher level thinking skills, and
- enrich and improve by focusing on Steps 1 and 6 the delivery of the content area curriculum.

This workshop is designed to help answer these questions:

- Why should we be concerned if students enjoy the learning process?
- What's the difference between intrinsic and extrinsic motivation?
- Why are some common elements and examples of projects proven to be enjoyable for both teachers and students?
- How can attention to the design and assessment of projects make them more meaningful to students?

The workshop allows time for participants to practice revising their own research project so that it:

- asks for higher level thinking skills
- discourages plagiarism and term paper downloading from the Internet
- is assessed using a tool that helps all students succeed
- can be a successful experience for students of all grade levels and abilities
-

We'll focus on making the often dreaded research assignment the one everyone can't wait to do!

Worksheet and Resources

Describe one experience you have had as learner that could be described as "exciting or pleasurable."

List five tasks you find to be intrinsically motivating about your job. (You'd do them whether you got paid or not.) Do they have anything in common?

COMMINALITIES?

1.

2.

3.

4.

5.

Resources:

- Brooks, *In Search of Understanding: The Case for Constructivist Classrooms.* ASCD, 1993.
- Duncan and Lockhart*, I-Search, You Search, We All Learn to Research*. Neal-Schuman, 2000. (Elementary level)
- Habits of Mind website <www.habits-of-mind.net/>
- Johnson (Mary), Primary Sources in the Library: A Collaboration Guide for Library Media Specialists. Linworth, 2003
- Kohn, *Punished by Rewards*. Houghton-Mifflin, 1993.
- Csikszentmihalyi, *Flow.* Harper, 1990.
- Macrorie. *The I-Search Paper*. Ken Heinemann Educational Books, 1988. (Secondary level)
- Norman, *Things That Make Us Smart.* Addison-Wesley, 1993.
- Wurman, *Information Anxiety.* Bantam, 1990.

Example URLs

- Mankato Memories: <http://www.isd77.k12.mn.us/schools/dakota/worldwarII/worldwarIIinterviews.htm>
- CyberFair: Science Fair Help: http://www.isd77.k12.mn.us/resources/cf/

URLS verified May 2007.

The ESSENTIAL Question

Do academic assignments that students and teachers really enjoy have any common characteristics - especially those that involve research and information skills?

Ground rules: These assignments must:

- involve learning and doing something worthwhile
- stress involvement rather than entertainment
- be intrinsically motivating

Extrinsic and Intrinsic Motivation

Examples of extrinsic motivators:

Extrinsic: If you do this for me, I'll do that for you.

Examples of intrinsic motivators:

Intrinsic: I do this to please myself.

Why extrinsic motivation doesn't work (Kohen)

- Rewards punish
- Rewards rupture relationships
- Rewards ignore reasons
- Rewards discourage risk-taking
- Extrinsic motivation can **discourage** desired behaviors

Why intrinsic motivation is extremely important

- To create life-long learning
- To stem negative behaviors and improve classroom climate (60%)
- To make students and teachers partners in the learning process

Informal Learning vs School Learning from Donald Norman	
Informal Learning	**School Learning**
Unstructured	Structured
Joint or group activity	Individual
Goal well-motivated from users' point of view	Goal not well-motivated from users' point of view
Activity is captivating "fun"	Fun is not relevant
No interruptions	Constant interruptions
Frequent "flow"	No "flow"
Self-paced	Fix-paced
Choice of topic, time and place	Fixed topics
Activity can be done throughout life	Activities are not done outside of school

Doug's Four A's of Great Research Projects

Assignments that Matter

1. **Motivational research projects have clarity of purpose and expectations.**

2. **Motivational research projects give students choices.**

3. **Motivational research projects are relevant to the student's life.**

The 10 Developmental Task of Adolescents - G. Robert Carlson

1. Independence from parents
2. New relationships with peers: new groups, groups have new importance
3. Interest in opposite sex
4. Finding a role model
5. Coming to terms with one's body
6. Coming to terms with one's sexuality
7. Achieving a sense of status - being best or expert
8. Developing a personal set of values
9. Gaining work experience
10. Making a vocational choice

4. **Motivational research projects stress higher level thinking skills and creativity.**

5. **Motivational research projects answer real questions.**

A Research Question Rubric: Not all research questions are created equal.

Level One: My research is about a broad topic. I can complete the assignment by using a general reference source such as an encyclopedia. I have no personal questions about the topic.
Elementary example: My research is about an animal.
Secondary example: My research is about the economy of a state.

Level Two: My research answers a question that helps me narrow the focus of my search. This question may mean that I need to go to various sources to gather enough information to get a reliable answer. The conclusion of the research will ask me to give a supported answer to the question.
Elementary example: What methods has my animal developed to help it survive?
Secondary example: What role has manufacturing played in a state's economic development?

Level Three: My research answers a question of personal relevance. To answer this question I may need to consult not just secondary sources such as magazines, newspapers, books or the Internet, but use primary sources of information such as original surveys, interviews, or source documents.
Elementary example: What animal would be best for my family to adopt as a pet?
Secondary example: How can one best prepare for a career in manufacturing in my area of the state?

Level Four: My research answers a personal question about the topic, and contains information that may be of use to decision-makers as they make policy or distribute funds. The result of my research is a well supported conclusion that contains a call for action on the part of an organization or government body. There will be a plan to distribute this information.
Elementary example: How can our school help stop the growth in unwanted and abandoned animals in our community?
Secondary example: How might high schools change their curricula to meet the needs of students wanting a career in manufacturing in my state?

Learning Verbs According to Bloom

Knowledge

Acquire	Indicate	Outline	Recite	Select
Count	Label	Point	Recognize	State
Define	List	Quote	Record	Tabulate
Distinguish	Match	Read	Repeat	Trace
Draw	Name	Recall	Reproduce	Write
Identify				

Comprehension

Associate	Differentiate	Extrapolate	Illustrate	Reorder
Change	Discuss	Fill in	Interpret	Represent
Conclude	Distinguish	Generalize	Paraphrase	Rewrite
Compare	Draw	Give in your	Predict	Restate
Contrast	Estimate	own words	Prepare	Summarize
Convert	Explain	Give examples	Read	Transform
Describe	Extend	Infer	Rearrange	Translate
Determine				

Application

Apply	Demonstrate	Illustrate	Predict	Show
Calculate	Develop	Manipulate	Prepare	Show
Choose	Discover	Modify	Produce	Transfer
Classify	Employ	Operate	Relate	Use
Complete	Examine	Organize	Restructure	Utilize
Compute	Generalize	Practice		

Analysis

Analyze	Contrast	Discriminate	Infer	Relate
Break down	Deduce	Distinguish	Order	Select
Categorize	Detect	Group	Outline	Separate
Classify	Diagram	Identify	Point out	Subdivide
Compare	Differentiate	Illustrate	Recognize	Transform

Synthesis

Arrange	Deduce	Generalize	Prescribe	Rewrite
Categorize	Derive	Generate	Produce	Specify
Combine	Design	Integrate	Propose	Summarize
Compile	Devise	Modify	Rearrange	Synthesize
Compose	Develop	Originate	Reconstruct	Tell
Constitute	Document	Organize	Relate	Transmit
Construct	Explain	Plan	Reorganize	Write
Create	Formulate	Prepare	Revise	

Evaluation

Appraise	Criticize	Distinguish	Measure	Standardize
Argue	Critique	Evaluate	Rank	Summarize
Assess	Decide	Grade	Rate	Support
Compare	Describe	Judge	Recommend	Test
Conclude	Determine	Justify	Relate	Validate
Consider	Discriminate	Interpret	Select	Verify
Contrast				

Activity

Choose a popular research topic from your school's curriculum (or use one from list below). Work with your team to develop an assignment at each of the four levels of the Research Question Rubric.

Your topic:		
Level	**Key attributes**	**Your Assignment**
One	**Asks for simple recall**	
Two	**Asks a specific question**	
Three	**Asks for personal response**	
Four	**Includes a call for action**	

Notes:

- States
- Diseases
- Current event
- Explorers
- Presidents
- Careers
- The Constitution
- Nutrition
- Simple machines
- Authors

The principal sin of plagiarism is not ethical, but cognitive. – Brad Hokanson, University of Minnesota.

Activities That Involve

1. **Motivational research projects involve a variety of information finding activities.**

2. **Motivational learning tends to be hands-on.**

3. **The use of technology can be exciting for many students.**

4. **Good projects often use formats that use multiple senses.**

5. **Interesting projects are often complex, but are broken into manageable steps.**

6. **Collaborative learning is often stimulating and results in better products than individual work.**

Kuhlthau's Four Step Strategy

1. Students create a timeline of the research process to track their progress.
2. Students flow chart the entire research process.
3. Students hold conferences with teachers and librarians to assess progress.
4. Students write a summary statement of their focus during the assignment.

Computer Skills for Information Problem-Solving:
A Curriculum Based on the Big Six Skills Approach

1. Task Definition:

The first step in the information problem-solving process is to recognize that an information need exists, to define the problem, and to identify the types and amount of information needed. In terms of technology, students will be able to:

A. Use e-mail, real-time communications (e.g., listservs, newsgroups, instant messaging services, chat rooms, IP telephony), desktop teleconferencing, and groupware on the Internet and local area networks to communicate with teachers regarding assignments, tasks, and information-problems.

B. Use e-mail, real-time communications (e.g., listservs, newsgroups, instant messaging services, chat rooms, IP telephony), desktop teleconferencing, and groupware on the Internet and local area networks to generate topics and problems and to facilitate cooperative activities among groups of students locally and globally.

C. Use e-mail, real-time communications (e.g., listservs, newsgroups, instant messaging services, chat rooms, IP telephony) desktop teleconferencing, and groupware on the Internet and local area networks to generate topics and problems and to facilitate cooperative activities with subject area experts locally and globally

D. Use computerized graphic organization, brainstorming or idea generating software to define or refine the information problem. This includes developing a research question or perspective on a topic.

2. Information Seeking Strategies:

Once the information problem has been formulated, the student must consider all possible information sources and develop a plan for searching. Students will be able to:

A. Assess the value of various types of electronic resources for data gathering, including databases, CD-ROM resources, commercial and Internet online resources, electronic reference works, community and government information electronic resources.

B. Assess the need for and value of primary resources including interviews, surveys, experiments, and documents that are accessible through electronic means.

C. Identify and apply specific criteria for evaluating computerized electronic resources.

D. Identify and apply specific criteria for constructing meaningful original data gathering tools such as online surveys, electronic interviews, or scientific data gathering tools such as probes, meters, and timers.

E. Assess the value of e-mail, real-time communications (e.g., listservs, newsgroups, instant messaging services, chat rooms, IP telephony) desktop teleconferencing, and groupware on the Internet and local area networks as part of a search of the current literature or in relation to the information task.

F. Use a computer to generate modifiable flow charts, time lines, organizational charts, project plans (such as Gantt charts), and calendars which will help the student plan and organize complex or group information problem-solving tasks.

G. Use handheld devices such as personal digital assistants (PDAs or electronic slates) to track contacts, create to-do lists, and schedules.

3. Location and Access:

After students determine their priorities for information seeking, they must locate information from a variety of resources and access specific information found within individual resources. Students will be able to:

A. Locate and use appropriate computer resources and technologies available within the school library media center, including those on the library media center's local area network, (e.g., online catalogs, periodical indexes, full-text sources, multimedia computer stations, CD-ROM stations, online terminals,

scanners, digital cameras).

B. Locate and use appropriate computer resources and technologies available throughout the school including those available through local area networks (e.g., full-text resources, CD-ROMs, productivity software, scanners, digital cameras).

C. Locate and use appropriate computer resources and technologies available beyond the school through the Internet (e.g., newsgroups, listservs, WWW sites, ftp sites, online public access library catalogs, commercial databases and online services, and other community, academic, and government resources).

D. Know the roles and computer expertise of the people working in the school library media center and elsewhere who might provide information or assistance.

E. Use electronic reference materials (e.g., electronic encyclopedias, dictionaries, biographical reference sources, atlases, geographic databanks, thesauri, almanacs, fact books) available through local area networks, stand-alone workstations, commercial online vendors, or the Internet.

F. Use the Internet or commercial computer networks to contact experts and help and referral services.

G. Conduct self-initiated electronic surveys conducted through e-mail, listservs, newsgroups and online data collection tools.

H. Use organizational systems and tools specific to electronic information sources that assist in finding specific and general information (e.g., indexes, tables of contents, user's instructions and manuals, legends, boldface and italics, graphic clues and icons, cross-references, Boolean logic strategies, time lines, hypertext links, knowledge trees, URLs etc.) including the use of:

   1. search tools and commands for stand-alone, CD-ROM, and online databases and;
   2. search tools and commands for searching the Internet such as search engines, meta search tools, bots, directories, jump pages, and specialized resources such as those that search the Invisible Web.
   3. specialized sites and search tools commands that limit searches by date, location, format, collection of evaluated sites or other criteria.

4. Use of Information:

After finding potentially useful resources, students must engage (read, view, listen) the information to determine its relevance and then extract the relevant information. Students will be able to:

A. Connect and operate the computer technology needed to access information, and read the guides and manuals associated with such tasks.

B. Know and be able to use the software and hardware needed to view, download, decompress and open documents, files, and programs from Internet sites and archives.

C. Cut and paste information from an electronic source into a personal document complete with proper citation.

D. Take notes and outline with a word processor, database, or similar productivity program.

E. Record electronic sources of information and locations of those sources to properly cite and credit in footnotes, endnotes, and bibliographies.

F. Use electronic spreadsheets, databases, and statistical software to process and analyze statistical data.

G. Analyze and filter electronic information in relation to the task, rejecting non-relevant information.

H. Save and backup data gathered to secure locations (floppy disk, personal hard drive space, RW-CD, online storage, flash memory, etc.)

5. Synthesis:
Students must organize and communicate the results of the information problem-solving effort. Students will be able to:

A. Classify and group information using a word processor, database or spreadsheet.
B. Use word processing and desktop publishing software to create printed documents, applying keyboard skills equivalent to at least twice the rate of handwriting speed.
C. Create and use computer-generated graphics and art in various print and electronic presentations.
D. Use electronic spreadsheet software to create original spreadsheets.
E. Generate charts, tables and graphs using electronic spreadsheets and other graphing programs.
F. Use database software to create original databases.
G. Use presentation software to create electronic slide shows and to generate overhead transparencies and slides.
H. Create and use projection devices to show hypermedia and multimedia productions with digital video, audio and links to HTML documents or other programs. Convert presentations for display as web pages.
I. Create web pages and sites using hypertext markup language (HTML) in a text document or webpage creation tools and know the procedure for having these pages loaded to a web server.
J. Use e-mail, ftp, groupware, and other telecommunications capabilities to publish the results of the information problem-solving activity.
K. Use specialized computer applications as appropriate for specific tasks, e.g., music composition software, computer assisted drawing and drafting programs, mathematics modeling software, scientific measurement instruments, etc.
L. Properly cite and credit electronic sources, including text, graphics, sound and video, of information within the product as well as in footnotes, endnotes, and bibliographies.

6. Evaluation:
Evaluation focuses on how well the final product meets the original task (effectiveness) and the process of how well students carried out the information problem-solving process (efficiency). Students may evaluate their own work and process or be evaluated by others (i.e. classmates, teachers, library media staff, parents). Students will be able to:

A. Evaluate electronic presentations in terms of both the content and format and design self-assessment tools to help them evaluate their own work for both content and format.
B. Use spell and grammar checking capabilities of word processing and other software to edit and revise their work.
C. Apply legal principles and ethical conduct related to information technology, copyright and plagiarism.
D. Understand and abide by telecomputing etiquette when using e-mail, newsgroups, listservs and other Internet functions.
E. Understand and abide by acceptable use policies and other school rules in relation to use of the Internet and other electronic technologies.
F. Use e-mail, real-time communications (e.g., listservs, newsgroups, instant messaging services, chat rooms, IP telephony) desktop teleconferencing, and groupware on the Internet and local area networks to communicate with teachers and others regarding their performance on assignments, tasks, and information-problems.
G. Thoughtfully reflect on the use of electronic resources and tools throughout the process.

Activity

Technology use can be exciting and motivating for students to use when completing an information literacy project. Choose a project that you currently have in your curriculum and brainstorm ways to incorporate technology into it in meaningful ways at each stage of the Big6 process. Note any special problems or student skills that may need to be taken into account when using the technology.

Big6 step	Technology uses	Cautions?
Task definition		
Seeking strategies		
Locate and access		
Use of information		
Synthesis		
Evaluation		

How might Web 2.0 tools like blogs, wikis, and social book marking sites contribute to the research process?

Assessments that Help

1. **Motivational research projects have results that are shared with people who care and respond/react**.

2. **Learning that is assessed by an authentic tool is more meaningful than a paper and pencil test.**

3. **Samples and examples give the learner a clear idea of what quality work looks like.**

4. **Well-designed projects allow the learner to reflect, revisit, revise, and improve their final projects.**

Your Multimedia Presentation Should Include the Following

Your group's task is to present a lesson to the class that tells why a specific even from early American History is still studied today.

Content:

☐ ☐ ☐ 1. In large bold print, label your presentation with both the location and the years of the event. Also, provide clues that locate your picture in time. For example show:

☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐

a) proper clothing
b) correct transportation
c) tools and weapons
d) people doing their daily work

☐ ☐ ☐ 2. Draw pictures of the key events. Clearly illustrate what happened in your area that was so important that we're still studying it today.

3. Include pictures of the main geographical features.

☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐

a) rivers, oceans, lakes
b) forests, deserts
c) mountains, canyons

4. Include symbols that were important to the people in your region.

☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐

a) religious symbols
b) job-related symbols
c) celebration or holiday symbols

☐ ☐ ☐ 5. Include important or famous people.

☐ ☐ ☐
☐ ☐ ☐

6. Include important or famous sayings or documents.
7. Cite the sources (3) of all information given.

Format:

☐ ☐ ☐
☐ ☐ ☐

8. A minimum of eight slides, each with a uniform background and layout style.
9. Easily seen and understood navigation buttons.

☐ ☐ ☐
☐ ☐ ☐

10. A logical organization and structure for the stack.
11. Readable text.

☐ ☐ ☐
☐ ☐ ☐

12. Clear graphics.
13. Sounds and movies used to add to the understanding of the topic. (extra credit)

Check off each box as you complete the items listed. After you have finished your stack, indicate your region and sign your names below.

Region or Colony _____

_____ (student) _____ (student)

_____ (student) _____ (student)

What might be added to this checklist?

Performance checklist (2nd grade) for:

Temperature Graph for Climate in _____
City

_____ My graph has a title

_____ My grid is set up correctly

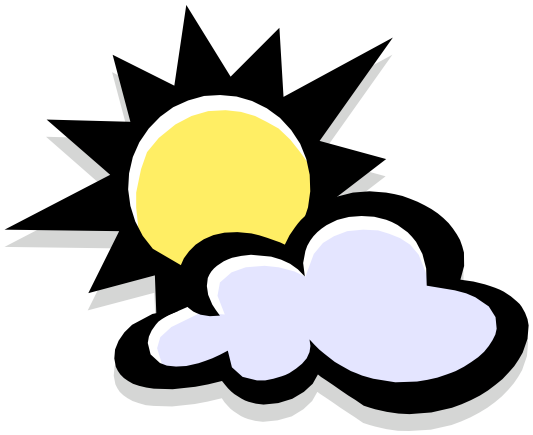
_____ The numbers are easy to read and evenly spaced

_____ Points are plotted correctly on the grid

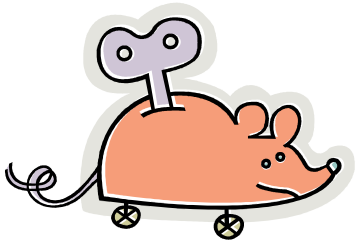
_____ Temperatures are written correctly

_____ Lines are straight and connect the points

_____ I have plotted 3 full weeks of temperatures



Science Assessment – Grade 9



Mouse Trap Cars!!!!!

Preliminary Run Date _____ **Final Run Date** _____

Task: Construct a vehicle that is powered entirely by a mouse trap with the goal of traveling the greatest distance possible.

Qualifying Specifications:

- You must use the mousetrap provided in class.
- All force to move the vehicle must come from the spring in the mousetrap. (Example – the mousetrap cannot be used to turn on an electric motor to power the wheels.)
- The spring cannot be re-wound to change the pushing force.
- The vehicle may not be attached to the walls, floor, ceiling, etc..
- The mousetrap must move with the vehicle.
- All vehicles will be started against a vertical wall and started by setting off the mousetrap.
- Distance will be measured from the starting line to the rear-most part of the vehicle.
- Additional mousetraps are available to purchase for $.50 each.

Evaluation: This project is worth 50 lab points.

20 pts **DISTANCE TRAVELED**

Points	0	5	10	15	20
Meters	0-1	1-2	2-3	3-4	4-5

* 1 bonus point for each 5m after the first 5m!!!

10 pts **WRITTEN DESCRIPTION** of how the mousetrap provides the energy to move the vehicle. Describe the use of simple machines in the operation of the vehicle.

10 pts **ORAL PRESENTATION** of your basic design, how you got your idea, how your idea changed, and how you expect your vehicle to perform in the final run.

10 pts **SKETCH** of the vehicle illustrating how it functions. In the sketch indicate all simple machines present.

* Written description and sketch are due when you give your presentation

Sample assessment tool used by West High School Science Department, Mankato Area Public Schools

Evaluation Sheet

Name(s) _____

_____

Period _____

10 points	7 points	4 points	0 points
Written Description: Clear, organized and understandable. Includes accurate information concerning energy transfer, kinetic energy, and potential energy. Describes types of machines used, mechanical advantage, effort forces, and resistance forces.	Somewhat disorganized, hard to understand, inaccurate, and missing some important information.	Disorganized, hard to understand, and inaccurate.	Missing
Oral Presentation: Clearly and completely describes the basic design of your vehicle. Includes how your plan may have changed during the building process, where your plan came from, and your expectations for how it will perform in the final run.	Somewhat rushed, unclear, and missing some of the basic information.	Very rushed, unclear, and missing much of the basic information.	Missing
SKETCH: Very easy to read, well organized and accurately includes each type of machine, Force in, Force out, Effort, Resistance, and MA. Illustrates how the vehicle works	Somewhat messy, hard to read, disorganized, and missing some important information.	Very messy, hard to read, and missing much of the important information.	Missing

Distance Traveled

Points	0	5	10	15	20
Meters	0-1	1-2	2-3	3-4	4-5

* bonus points (1 for each 5m after the first 5m) _____

Total Score: _____

Activity

Let's take a break from education. You've just taken the job as a restaurant critic for the local paper. You need a tool to help you evaluate places you'll be dining. On the left below, list up to a dozen "quality indicators" for a good dining experience. (You may wish to pick only one area to evaluate such as food quality, service, atmosphere, cleanliness, etc.) On the right, prioritize the indicators to help determine the number of stars the restaurant deserves:

Quality Indicators:	**Star rating**
1.	**To get ONE star the restaurant must have**
2.	
3.	
4.	
5.	**To get TWO stars the restaurant must have**
6.	
7.	
8.	
9.	**To get Three stars the restaurant must have**
10.	
11.	
12.	
	To get Four stars the restaurant must have

Something to think about: My job as teacher is not to assess your work, but to teach YOU to assess your own work. I will only help you evaluate the quality of the tools you use to improve your own efforts. That way you will continue to grow long after the class is over. - Doug

Attitude (Teacher Attitude, That Is) is Everything

1. **Teachers and media specialists who enjoy authentic, project-based learning are comfortable with a loss of control over time, the final product, and "correct" answers.**

2. **These teachers and media specialists accept active students rather than passive students.**

3. **The professional's belief that given enough time, resources, and motivation, all students are capable of high performance is critical**.

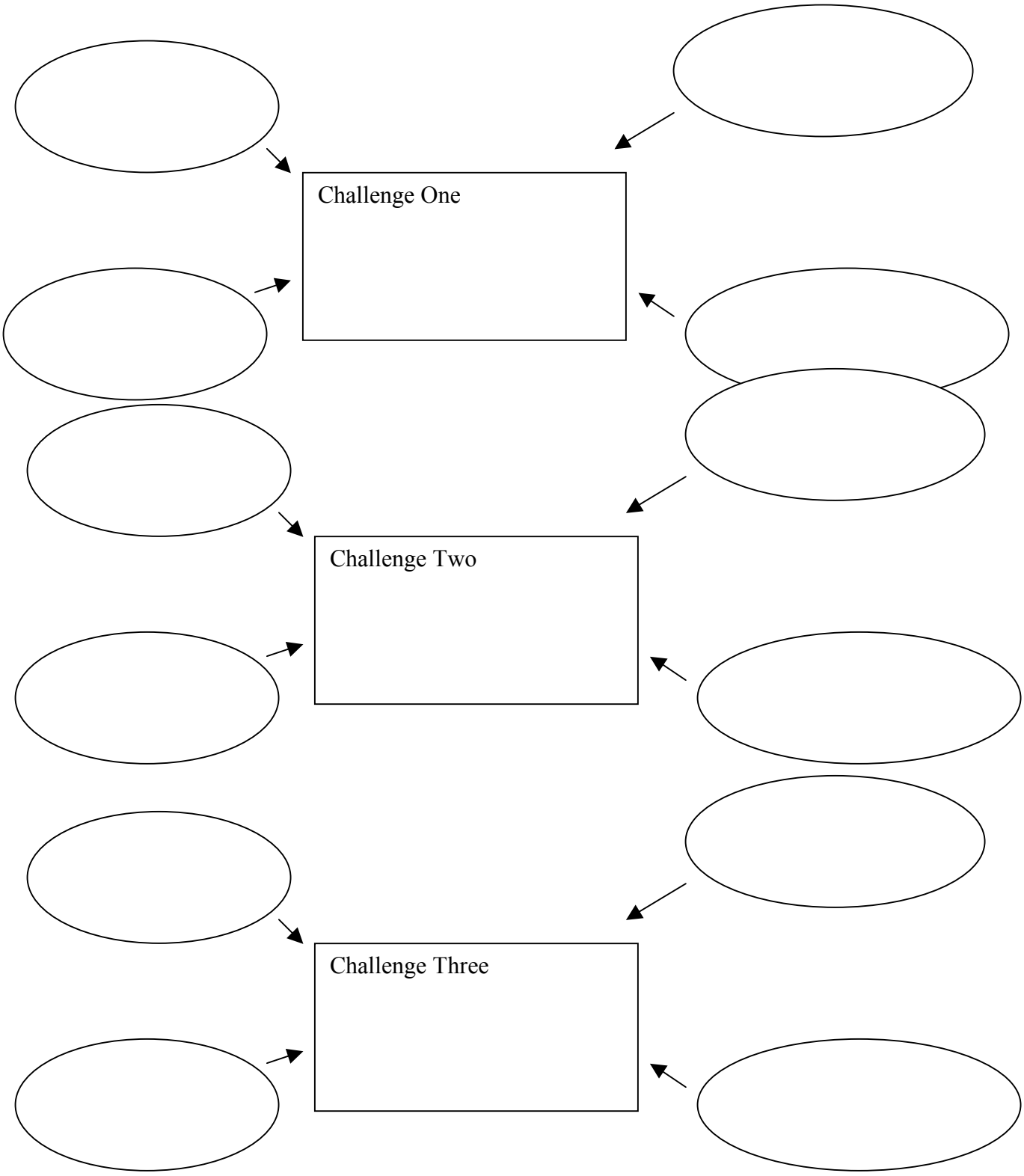
4. **Like media specialists, teachers who do exciting projects recognize that their expertise is in the learning and research process rather than in any particular subject area**.

5. **Teacher enthusiasm becomes more important than ever.**

6. **Teachers and media specialists who work on these kinds of project know that they don't always work the first time.**

Activity

Change is difficult for everyone. What are the three biggest challenges you face implementing some of the changes we talked about today? Use the large center boxes to state the challenge and then exchange your sheet with a neighbor who will fill in the smaller boxes with possible strategies for overcoming those challenges.



Designing Research Projects Students (and Teachers) Like

MultiMedia Schools, Nov-Dec 1999

Consider these scenarios:

Scenario 1:

Michael is a wonderful young man. Handsome, intelligent, caring and sweet, he's better than about 99% of the rest of kids out there. But the one thing he is not is much of is a scholar. He is diligent, but perfunctory, about his school assignments.

On occasion, however, Mike gets very excited about his schoolwork. Science fair is one of those times. He spends weekends conducting experiments, visiting the library, searching websites, making graphs, taking photos, and carefully designing a presentation board illustrating his findings. He is involved, working entire days consumed by his task.

One of his best projects was one he completed in the fifth grade. He wanted to determine what substance, when applied to ice would melt it the most quickly. He drilled holes in the bottoms of four or five aluminum pie plates, taped over the holes, and then filled them with water. After being left outside over night, he removed the tape, carefully balanced them on measuring cups, spread a variety of materials on top of each icy pie plate, and then diligently recorded how much water dripped through the opening each hour during the day. He used his findings to design spreadsheets and graphs. He researched facts about water, ice, and commercial de-icers. He used the information to verify his hypothesis. He practiced answering questions a judge might ask at the science fair itself. Not much here that could not be replicated. Nothing really complex.

Scenario 2

Beth's class has chosen an interesting way to examine the impact of World War II. Instead of reading from a textbook, Beth has asked for volunteers from the community to come in and be interviewed by teams of her eight grade students about what impact the war had on them, either as military personnel or as civilians.

After careful interviews, the students wrote a narrative, took digital photographs, and scanned memorabilia from the time. They looked for web-based references to the topics and terms they heard about. And finally, they used all this information to create web pages that allow them to share what they learned about their neighbors.
<http://www.isd77.k12.mn.us/schools/dakota/worldwarII/worldwarIIinterviews.htm> *Both students and teachers worked "overtime" to interview, write, clarify, re-write and design these pages.*

At an open house, the interviewees and their families were invited in to view and comment on their web pages. Over 11,000 visitors have read these pages, including many distant family members of those interviewed.

For the past few years I have been looking at projects like these from the Mankato schools that kids and teachers like. I've been asking students and teachers to describe learning activities they remember being particularly enjoyable. And in doing so, I have found they shared many common characteristics. These

characteristics tend to group themselves into three categories. Each category is briefly described below:

Assignments that matter:

1. **Motivational research projects have clarity of purpose and expectations.** When Mike started his science fair project, he had a good guide at: <http://www.isd77.k12.mn.us/resources/cf/welcome.html>. On this website are also the forms which would be used to judge (assess) his completed project. An understanding of the scientific method including how to form a hypothesis and how to collect supporting data through experimentation and research is clearly stated as the purpose. This is a life-long, usable set of skills. Science fair students undertake projects worth doing, not just busy work.

2. **Motivational research projects give students choices.** Anyone who has ever attended a science fair has to marvel at the range of topics kids are interested in. Good projects surround every aspect of every branch of science from chemistry to physics to biology. Now here is the important concept*: If the purpose of the assignment is to teach the scientific method, it doesn't make any difference what the topic is!* Dig down and look at the core concepts your research assignments are trying to teach, and let the students pick a specific subject that interests them.

3. **Motivational research projects are relevant to the student's life.**
   For our students, World War Two and the Trojan War both just seem "a long time ago." By asking her students to interview local residents, the teacher added real faces and lives to history. The stories resonate with those doing the interviewing. So many times we ask our students to research important topics – environmental issues, historical issues, health issues - but fail to help them make the vital connection of why the findings are important to the people in town in which they live.

4. **Motivational research projects stress higher level thinking skills and creativity.** Think how different the results of a science project are than a paper that simply asks an "about" question. "Hey, Mike, write a research paper about ice." Boring! Instead brainstorm an original theory, design a means of testing it, and find ways to effectively communicate your findings. Suddenly we've moved up on Bloom's taxonomy from the knowledge and inference levels right to application, analysis, synthesis, and evaluation. What fun!

5. **Motivational research projects answer real questions.** Mike didn't know at the beginning of his project what really would melt ice the best. His rather creative guess was the laundry detergent (the kind with blue specks) would do the trick. The teacher may have guessed that there was a reason people paid good money for commercial de-icer, but the fact was, he probably did not know. It was interesting to watch as the experiment's data grew. Beth had no way of knowing the stories the World War II vets would be telling. Their lives were as fresh and exciting to her as they were to her students. Unfortunately, teachers rarely ask questions to which they do not believe they know the answer. Sort of sad, really. Diminishing to the student; boring for the teacher.

Activities that involve the researcher:

6. **Motivational research projects involve a variety of information finding activities.** As media specialists we are comfortable with our familiar old primary sources of reference books, magazine indexes, and trade books. Yet the answers to many of the personal, local, and timely questions cannot be found in them. They can provide excellent background information on important facts, but often we need to talk to experts, conduct surveys, design experiments, or look at other kinds of primary sources

to get precise information. The learners in these examples spent time with secondary sources too, but the generation of new knowledge through hands-on experimentation and primary sources was motivating.

7. **Motivational learning tends to be hands-on.** Mike's experiment involved using a hammer to pound nails, a camera to document his progress, a computer to generate charts, and scissors and paste to complete the poster board. Beth's student used tape recorders, scanners, digital cameras, and a web page construction program. Students are learning by doing, not just listening. Notice too, how many corollary skills were practiced in these "research" projects: writing skills, interviewing skills, photography skills, layout and design skills, and speaking skills.

8. **The use of technology can be exciting for many students.** Whether for planning, for research, or for communication, many students find the use of technology motivating. Neither Mike nor Beth's students used computer programs that were purposely designed to be "motivational." Ironically, the built-in attention getters in many programs – cute animations, sounds, etc. – can actually distract the student from the purpose at hand. It is the challenge of designing containers that make good productivity tools like graphic programs, desktop publishers, and web page construction kits - the virtual equivalent of a set of LEGOs.

9. **Good projects often use formats that use multiple senses.** Beth's students were asked to communicate their finds not only with words, but through sound and sight as well. Scanned artifacts like ration coupons, medals, and old photographs stimulated those students who may not be verbal learners. Our ability to digitize and present information is no longer restricted to the written word but now can include drawings, photos, sounds, music, animations and even movies. All are formats that carry important and often unique information.

Suggested products of units (computer generated when possible):
crossword puzzle, short story, game, videotape, model, drawing, audiotape, slide show, bulletin board, lesson, transparency, booklet, pamphlet, poem, newspaper, mobile, advertisement, multi-media show, puppet show, comic book, letter to the editor, photograph album, play, collage, mural, travel brochure, guide, manual, survey, chart or graph, animation, experiment, interview, map, book review, debates

10. **Interesting projects are often complex, but are broken into manageable steps.** Mike's science fair project took him over 60 hours to complete and involved dozens of tasks. But early in the project, he and his dad outlined the tasks to be done and established a timeline for their completion. Checking off completed tasks in itself is satisfying and motivational, and Mike learned some corollary planning and time management skills in the process. Large projects can be overwhelming even for adults, but planning smaller steps, building timelines, creating frequent deadlines, and scheduling multiple conferences turn complexity into manageability. It's also clear that some tasks in effective research projects often require sustained periods of time to complete, the regular 50 minute block of "library time" doesn't always work. Flexibly scheduled library/media time is important when implementing large projects.

11. **Collaborative learning is often stimulating and results in better products than individual work.** Beth asked her students to work in pairs. Joint problem solving, assigning and accepting responsibility, and discovering and honoring individual talents helped create a synergy that resulted in better, more satisfying web pages than students working alone would have produced. Not every project needs to be a

joint effort, but real-world work environments increasingly stress teamwork. Teamwork in school is not only more enjoyable, but leads to the application of practical interpersonal skills as well.

Assessments that Help by Promoting Growth and Showing Care

12. **Motivational research projects have results that are shared with people who care and respond**. Science fair participants don't get grades. In Mike's school they don't even get any academic credit. Beth's kids got the same credit as those who took a multiple choice test on World War II. So why do kids go to all the extra work? I believe kids get hooked because big people take the time to really look at the work they have done and comment on it. Lots of other students gather on science fair day and share their findings. People take science fair seriously. The community, both physically and virtually, visited the student's World War II web pages. Assessments and reviews by peers, experts, and neighbors (any audience beyond the teacher) are common in scouting, athletics, dramatics, 4-H, and music organizations.

13. **Learning that is assessed by an authentic tool is more meaningful that a paper and pencil test.** Mike was evaluated on his science fair project using a rubric like the one at < http://www.isd77.k12.mn.us/resources/cf/rubric.htm>. This more closely resembles the criteria used in assessing a person's performance in the real world. Mike and his dad had the rubric at the beginning of the project and used it several times to check his progress during completion of the project. It was easy to recognize both what was good as well as what needed improvement. Quality indicators like rubrics and checklists that are given to students when an assignment is made can help guide learning and keep guesswork to a minimum. As students become more sophisticated in the research process, they should be expected to choose or design their own "rules of quality," one of the indicators of a genuinely intrinsically motivated person.

14. **Samples and examples give the learner a clear idea of what quality work looks like.** Mike had a sample project to look at on the web at < http://www.isd77.k12.mn.us/resources/cf/batteries.html>. Beth's class next year can use the World War II site as an exemplar of a quality project. Assignments need to change enough from year to year so that copying is not possible.

15. **Well-designed projects allow the learner to reflect, revisit, revise, and improve their final projects.** While Beth's class had a completion date, students continued to edit and revise their work as they received feedback from those they interviewed and web site visitors. There is satisfaction to be gained from observed growth. Good projects, like gardens, musical repertoires, and relationships, are probably always works in progress.

So if we know all this about good research projects, why don't all teachers design them with some or all of these elements? Well, a 4th "A" sneaks in. **(Teacher) Attitude is Everything**

16. **Teachers and media specialists who enjoy authentic, project-based learning are comfortable with a loss of control over time, the final product, and "correct" answers.** If some parts of the curriculum don't get "covered," if conflicting evidence causes confusion, or a controversial solution to a problem is suggested, these educators roll with the punches. They have the intellectual confidence to handle ambiguity.

17. **These teachers and media specialists accept active students rather than passive students.** They have developed new rules of behavior that stress student responsibility, and have trained their principals

to differentiate between active learning and a classroom out of control.

18. **The professional's belief that given enough time, resources, and motivation, all students are capable of high performance is critical**. It's not just the talented and gifted student who can make choices, solve problems creatively, and complete complex tasks. These teachers and media specialists know that most students rise to the level of performance expected of them, and that great ideas can come from anyone in the class.

19. **Like media specialists, teachers who do exciting projects recognize that their expertise is in the learning and research process rather than in any particular subject area**. No longer are these folks information dispensers, but guides for information builders. The happiest teachers are co-learners in the classroom, especially when learning new technology tools. And students get the satisfaction that comes from teaching as well.

20. **Teacher enthusiasm becomes more important than ever.** The best projects I have seen have always designed by teachers who are enthusiastic about what they are doing and how they are doing it. The downside to this is that it is very difficult to create recipes for specific projects that can be easily adopted by other teachers. We can all use principles and guidelines like the ones in this article, but to say a project, no matter how well designed, is going to work for every teacher and every group of students is impossible.

21. **Teachers and media specialists who work on these kinds of project know that they don't always work the first time.** But they keep trying.

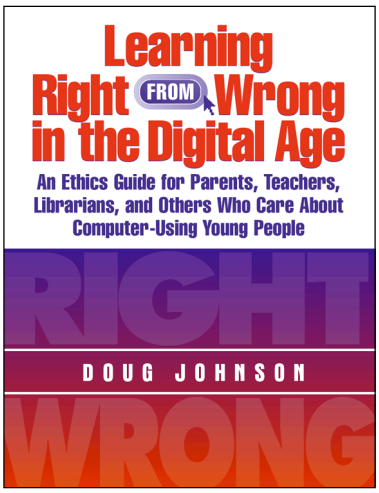
Conclusion

Research must matter. The research needs to be important to the researcher. If it isn't, students will go through the motions. And Johnson's First Law of School Work will kick in: *A job not worth doing is not worth doing well.* One of the best things we as teachers and media specialists can do is work very hard to make sure research projects are well designed and intrinsically motivating. Compare your next assignment to the rubric in Table One. Aim for level three in all your projects, and hope your students are lucky enough to get to do a few number 4 level tasks sometime during their school years.

Enjoyable learning experiences that are both motivating and meaningful don't just happen. They require thoughtful preparation and the conscious use of lessons learned from previous successful projects. All of us who work with students on research projects need to keep asking ourselves questions like:

1. What are the barriers to better research?
2. How do we create meaningful assessment tools that can help us become more comfortable with ambiguity?
3. How do I make sure every student is intrinsically motivated to keep learning throughout his life by finding, evaluating and using information?

Hey, it sounds like life-long learning should be a reality for all of us, student and teacher alike!



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