Grazing the Net: Raising a Generation of Free Range Students

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Downloaded from http://www.ilt.columbia.edu/text_version/k12/livetext/docs/graze.html

Introduction

The student sits at a classroom computer grazing Internet - a global network linking the student with vast databases, innumerable bulletin boards and millions of users. The potential is amazing. The information harvest could be impressive. Schools that can afford it are rushing to install WANs (wide area networks), LANs (local area networks) and Internet nodes so that all classrooms might sit down to sample the electronic feast. Access becomes priority - for some it becomes obsession. But shouldn't we be asking some important questions about this miracle? If highways are a mixed blessing -carrying some to grandmother's house for dinner but crashing others who have celebrated to the extreme - then what are the risks associated with the Net and how might we minimize them? How might we take advantage of the Net to raise a generation of free range students?

Students as Infotectives

The rich information resources to be found in cyberspace (the Internet) are both a blessing and a curse. Unless students have a toolkit of thinking and problem-solving skills which match the feasts of information so readily available, they may emerge from their meals bloated with techno-garbage, information junk food or info-fat. We must teach students to graze and digest the offerings thoughtfully in order to achieve insight.

We must guide our students to become infotectives. What is an infotective? . . a student thinker capable of asking great questions about data (with analysis) in order to convert the data into information (data organized so as to reveal patterns and relationships) and eventually into insight (information which may suggest action or strategy of some kind). An infotective solves information puzzles and riddles using all kinds of clues and new technologies. The problem-solving which often follows the detective work then requires synthesis (invention) and evaluation (careful choices from lists of options). An infotective is a skilled thinker, researcher and inventor.

Infotective is a term designed for education in an Age of Information. In the smokestack school, teachers imparted meanings for students to digest, memorize and regurgitate. In Information Age schools, students make the meaning. They puzzle their way through piles of fragments - sorting, sifting, weighing and arranging them until a picture emerges. (Power
Unless we are connecting with Internet for edutainment, student questioning must be intense before, during and after visiting cyberspace. We must teach students to start with what Sizer calls "essential questions" - the kinds of probing inquiries which might extend over a month or a lifetime - questions worth asking, which touch upon basic human issues - investigations which might make a difference in the quality of life - studies which might cast light in dark corners, illuminating basic truths. And then we must teach them how to conduct a thorough research study. Questioning persists throughout all stages of such a study.

Sample Research Question (Secondary)

"Imagine that you and your partners are consultants hired by the states of Washington and Oregon to recommend new policies to stem the decline of the fish harvests in the region during the past decade. Use Internet to identify all useful practices already tested around the globe and then determine the applicability of these practices to the particular conditions and needs of the Northwest. Create a multimedia report for the two governors sharing specific action recommendations as well as the evidence sustaining your proposals."

Unfortunately, schools have traditionally neglected the development of student questioning. According to Hyman (1980), for every 38 teacher questions in a typical classroom there is but one student question. Schoolhouse research, sadly, has too often fallen into the "go find out about" category. Topical research (Go find out about Dolly Madison) requires little more than information gathering. We must move beyond this traditional search for answers to simple questions. Instead of asking elementary students to find out all they can about a particular state or nation, for example, we should be asking them to compare and contrast several states or cities for a purpose - sifting, sorting and weighing the information to gain insight, to make a decision or to solve a problem.

Sample Research Question (Elementary)

"Imagine that your parents have been given job offers in each of the three following cities: New Orleans, Seattle and Chicago. Knowing of your access to Internet, they have asked you to help them decide which city will be the best for the family to select. Before gathering your information, discuss and identify with them the criteria for selecting a home city. Create a LinkWay or HyperCard stack showing the strengths and weaknesses of each city on the criteria your family considers important."

Conducting topical research on the Internet is a bit like pedaling a tricycle on the Interstate. To mix metaphors, classic school research projects (finding out about a particular state) are too much like shooting at sitting ducks.
Creating Constructivist Classrooms

Marty and Jacqueline Brooks’ 1993 ASCD publication In Search of understanding: the Case for Constructivist Classrooms makes a great primer for those who would like to develop classrooms which would fully entertain the potential of grazing the Net.

The title of one chapter, "Coming to Know One's World," seems such an apt way of thinking about exploring the Net. The guiding principles of constructivism match the themes of this article:

* Posing problems of emerging relevance to students.* Structuring learning around primary concepts: the quest for essence. * Seeking and valuing students’ points of view. * Adapting curriculum to address students’ suppositions. Assessing student learning in the context of teaching. (Page 33)

A list of descriptors portrays constructivist teachers as ideal partners to student Internet explorers:

1. Constructivist teachers encourage and accept student autonomy and initiative. 2. Constructivist teachers use raw data and primary sources, along with manipulative, interactive, and physical materials. 3. When framing tasks, constructivist teachers use cognitive terminology such as "classify," "analyze," "predict," and "create." 4. Constructivist teachers allow student responses to drive lessons, shift instructional strategies, and alter content. 5. Constructivist teachers inquire about students' understanding of concepts before sharing their own understanding of those concepts. 6. Constructivist teachers encourage students to engage in dialogue, both with the teacher and with one another. 7. Constructivist teachers encourage student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other. 8. Constructivist teachers seek elaboration of students' initial responses. 9. Constructivist teachers engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion. 10. Constructivist teachers allow wait time after posing questions. 11. Constructivist teachers provide time for students to construct relationships and create metaphors. 12. Constructivist teachers nurture students' natural curiosity through frequent use of the learning cycle model. (pp. 103-117)

This excellent book should sit right alongside your copy of the Dummy’s Guide to the Internet. It makes little sense to set students free to graze cyberspace if classrooms do not nurture the kinds of thinking and learning described by the Brooks.
Eisenberg's Big Six Skills - Information Problem-Solving

Unfortunately, the K-12 literature on a district-wide approaches to research by students is thin. It has long been dominated by discipline-specific models (from social studies, science, etc.) which do not always dovetail with each other, and these usually fail to address the kind of research which will be possible with the Net. In developing district plans to exploit the full potential of cyberspace, we must come to agreement on core research skills.

Eisenberg's Big Six is one promising model for school research, one frequently cited on the Library-Media bulletin board on Internet.

Eisenberg's Big Six:

1. Task Definition 1.1 Define the problem 1.2 Identify the information requirements of the problem

2. Information Seeking Strategies 2.1 Determine the range of possible sources 2.2 Evaluate the different possible sources to determine priorities

3. Location and Access 3.1 Locate sources (intellectually and physically) 3.2 Find information within sources

4. Use of Information 4.1 Engage (e.g., read, hear, view) the information in a source 4.2 Extract information from a source

5. Synthesis 5.1 Organize information from multiple sources 5.2 Present information

6. Evaluation 6.1 Judge the product (effectiveness) 6.2 Judge the information problem-solving process (efficiency) (Page 35)


Unfortunately, this model, while intended to promote higher level thinking, can too easily be used to perpetuate the information-gathering and topical research patterns warned against in the previous section. A careful reading of the full text of Eisenberg's model raises the following issues:

1) Information is not the same as knowledge or insight. We are overwhelmed suddenly with information. What we need is insight. Insight answers the "So what?" question. Insight helps to guide decision-making. Eisenberg's model tells us too little about the path from information to insight.
2) Information problem-solving is not the same as problem-solving.

Classic problem-solving models call for repeated information gathering all along throughout the process, but the gathering of information is usually in the service of synthesis (invention) and evaluation (decision). Eisenberg’s section on Synthesis (Step Five) devotes too little attention to the thought process required by a fifth grader or a team of eleventh graders who have collected 455 pages of text and data tables on the Internet. How do they take those fragments, weigh them, assess the irreliability and validity and then apply them to the questions at hand to achieve some new understandings?

This is one of the biggest challenges facing teachers guiding students into (and out of) cyberspace. "What do I do with all the stuff once I have it? How do I screen out the garbage, know what is propaganda and what is distorted? How do I guard against what Toffler calls ‘info-tactics?’” And Eisenberg’s section on evaluation relates primarily to considering whether the research has been conducted in a thorough and effective manner. He does not develop either synthesis or evaluation in terms of general problem-solving and decision-making such as the one employed by Human Synergistics.

3) Students may not understand the problem well enough to define it.

Eisenberg properly warns that too little attention is usually devoted to the problem and task identification stage, but premature attention to either task may skew the research toward inappropriate or biased data sources. In the case of the fisheries simulation outlined above, students might be wise to start with several hours of grazing Internet to develop entry level awareness of key issues and aspects of the problem being studied.

4) Students may not know what they don't know.

It is difficult for students to plan investigations into complex and essential questions because they are often exploring virgin territory or regions which are quite foreign to their experience. It is one thing to collect the opinions of literary critics about Lord of the Flies and summarize their views - quite another to read them, digest them, weigh the work itself and come to a fresh synthesis which includes the researcher's own views. It is easier to follow Eisenberg’s steps when collecting information to match clear targets than when muddling through truly challenging questions.

5) Information seeking to solve real problems is recursive.

Eisenberg makes it abundantly clear in his book that one may keep circling and cycling back through the six steps of his model, but that section of the book can all too easily drop away in school translations which are printed up on charts to guide students. The importance of refreshing questions throughout the investigation can be forgotten in the rush toward answers.
6) Internet supports information cultivation as well as harvest. The Big Six steps relate most appropriately to existing information, but Internet allows students and classes of students to form information collaboratives designing and implementing research on issues like acid rain.

The Big Six are a wonderful platform for a district discussion of research skills, but they require revision and adaptation to match the potential of the Net.

Preparing Students for cyberspace - Internet Competencies

Internet poses a difficult challenge . . .

How will the voyager know when they have found truth? Answers will be a dime a dozen. Insight, on the other hand, may be rare. Without some grounding in epistemology (a theory of the nature of knowledge), we may raise a generation rich in data, facts and information but lacking in wisdom.

Success in cyberspace will require many of the following skills:

* Framing essential questions

Already outlined earlier in this article, various publications of the Coalition of Essential Schools do an excellent job of describing what this skill entails and includes. Both Ted Sizer and Grant Wiggins have published good work on this topic.

* Identifying subsidiary questions

Great questions spawn countless related questions which should then begin to suggest an Internet path for the researching team. Question-webbing is a powerful mapping tool to guide Internet voyages. Each voyage will probably suggest new questions as the unknowns become better known.

* Planning a cyberspace voyage

The charm and power of Internet is often found in its surprises. A good rule of thumb is to expect that 80 per cent of the wisdom collected will result from information sources unknown at the commencement of the voyage. The best plan, then, may be a flexible one concentrating on bold strokes like "I think I'll start with Veronica and plug in some keywords to see what comes up."

* Learning on the run

Like any good detective, the infotective keeps looking for clues and newsources even as the information begins scrolling past. Because software allows for hundreds of pages to be downloaded at amazing speed for reading later, the voyager can hop, skip and jump through the sources trying to pickup new possibilities. It is a good idea to remember that one is not
trying to find answers yet. It is a search for possibilities. Cast the net far out.

* Changing course

The journey will lead up blind canyons and sometimes prove frustrating. Effective exploration may require the energy and flexibility of a pinball jumping and bouncing around at incredible speed.

* Exploiting serendipity

Even though our culture often conspires to protect us from surprise, much of the power of Internet is to help us escape the boxes within which we live. We have carefully screened out information most of our lives. We are too often the prisoners of our cultures, our educational experiences and our biases. Internet can set us free.

* Asking for help

Ranging through dozens of different information sources the searcher often encounters conflicting and often confusing command structures. To prevent gridlock and wasted time, it makes sense to browse the help menu of these sources early in the game. "You mean I could have saved that file? If only I had known!"

* Asking for directions

According to popular stereotypes, men never ask for directions when they are lost. It makes sense to have several Internet guides at the ready and a friend to call when lost. Commentators claim that Internet is often "arcane." That simply means it may be easy to get lost.

* Screening and compacting garbage

TQM has not reached the Net. There is little quality control. Bulletin boards overflow with loquacious pedantry and bias masquerading as informed opinion. In smokestack schools students were sometimes urged to reach out toward big page numbers. A good report was a long report. Now it is so easy to download and then cut and paste hundreds of pages of text into a report that it becomes important to cull the essential, meaningful and reliable data. The garbage is set aside, compacted and discarded. The student establishes criteria for reliability and applies them to separate wheat from chaff. Key action verbs: choose, pick, select, separate, sift, and single out.
* Sorting data

In the process of collecting data, which may arrive in graphic form, as text or as numerical data, students must begin organizing and re-organizing the data in order to find patterns and relationships. This process is the foundation for analysis and synthesis. Key action verbs: align, arrange, array, assort, catalog, categorize, class, classify, cluster, compile, file, grade, group, layout, line up, list, order, organize, outline, pigeonhole, place, position, prioritize, program, rank, stack, tabulate. Associated tasks: bracket, collate, compare, contrast, correlate, equate, liken, match, relate.

* Analyzing data

As the data is collected, screened and sorted, the student keeps questioning in order to convert the data into insight. The student approaches understanding - "the big picture" - by undertaking many of the following actions: clarify, interpret, construe, deduce, derive, educe, gather, glean, infer, interpret, surmise, examine, probe, and unravel.

* Navigating in the dark

It is no accident that many boat chartering companies refuse to allow their customers to navigate in the dark. Darkness shifts perception and creates confusing illusions. A vast percentage of the visual cues upon which the casual sailor relies to guide the vessel are eliminated and replaced by a much more challenging system of lights. At times, the Net provides rich cues to guide one through the shallows and shoals. At other times, it seems like sailing in the dark. Ironically, most essential questions bring us into contact with darkness and the unknown. We often seek illumination in aspects of our lives which are the most frustrating. The simple answers, the conventional wisdom and the easily accessible recipes are often poor substitutes for the insights that emerge from night sailing. The best navigators learn to sail by the stars.

* Navigating in the mud

What sailor has never mis-timed the ebbing tide to find the boat wedged in mud? Who has never misread a chart and felt the sudden dragging warning along the keel of soft, sucking mud? The Internet offers its own information mudflats, vast expanses of soft data and opinion which can bog us down and slow our search for truth. Students must learn to skirt the shoals unless they are seeking shellfish buried within.

* Scanning from the crow’s nest

Maintaining perspective is paramount. While conducting research we can be trapped in the day-to-day survival activities going on at the deck level. We are too close to the action to see the patterns in it. "Climbing the mast"
means stepping outside and above the activities to see them with some distance and perspective. The crow’s nest allows one to look beyond the ship to ask questions about the challenges and goals which lie ahead. It means keeping the big picture and the essential questions in mind.

* Building and testing models

Model building is a form of synthesis which allows one to combine the key elements of a process or a system in a simplified version which permits manipulation of variables in order to explore relationships. Both the NCTM standards and Project 2061 call for students to learn both model building and systems thinking because they offer such explanatory power. The Systems Thinking and Curriculum Innovation Network Project (STACIN) developed by ETS, a simulation-modeling package, for eight years with high schools and middle schools. An authentic outcome of an Internet research project might be the development of a model to show the interplay of key elements in the ecosystem of a timber wolf family.

* Creating fresh answers and insight (synthesis)

Smokestack schools often relied too heavily on the collection and rehashing of old insights. Students were too rarely challenged to develop their own fresh insights. Sorting and sifting through the data they have collected on the Net, they arrange the jigsaw pieces and fragments without ever being shown the picture. They are “on their own.” Picture a student or a team of students actually manipulating their fragments to see what insights might leap forth. Software programs like the electronic thesaurus and various outlining and idea processing programs may help with the visualizing and thought play. To close the gap between information and insight, students are conjuring up new possibilities such as an array of strategies uniquely suited to protect and enhance the salmon harvest in their particular part of the Puget Sound.

There are at least three associated levels of thinking which must all occur at the same time in a dynamic, triple decker process which is a great deal like writing poetry or songs. All three levels operate concurrently and recursively (like the cat chasing its tail).

1. Envisioning

The top level involves conjuring and envisioning types of thought. The students conceive, conjecture, fancy, imagine, project and visualize. Envisioning is the top level because it lifts the product and outcome of the thinking beyond the past practice and old thinking. The thinker leaps out of the box of everyday, ho-hum thinking. Of course, grazing the Internet lends itself especially well to the encouragement of such flights of fancy. The Net provides the excursions, journeys, safaris, sallies, treks and spins trainers often employ to stimulate creative problem-solving in groups
(Synectics). Envisioning is the source of originality. Identifying possibilities and exploring the unthinkable is basic to this level.

2. Inventing

The middle level requires translation of possibilities into actualities. The imaginative play of the top level must be grounded in reality. What might actually work? What is a sensible version of that possibility? This is the level at which innovation is born. The student concocts new solutions to problems or coins new ideas and general principles. The research team may hatch a whole new action plan, fabricating and formulating initiatives to clean up local streams. Perhaps the thinking may advance to the development and testing of prototypes before engineering a final product.

3. SCAMPERING and Rearranging

The foundation for the top two levels is the rearranging mentioned earlier in this article in the sections on sorting and analyzing data. One model for such synthesis is SCAMPER (Osborne), with each letter standing for a strategy. S=substitute. C=combine. A=adapt. M=modify, magnify, minify. P=Put to other uses. E=eliminate. R=reverse. For this level to produce powerful results, the other two levels must be operating concurrently, as they supply the pressure and cognitive dissonance which inspires creation. The student arranges, blends, combines, integrates, tests, and adjusts the thought fragments until new pictures emerge.

* Suggesting and testing hypotheses

"What if . . . " thinking helps to propel and inspire mindful, purposeful research through the Net. The student learns to brainstorm multiple explanations and possibilities and then sets out to see which have the most explanatory value.

* Opening one's mind

Fundamental to the creation of new knowledge and insight is the process of suspending bias, challenging assumptions and noting premises. The researcher understands that the final product of the search will be made up of three related elements: assumptions, evidence and logic. All three must be opened to careful review and examination.

(The next portion on open minds is adapted from Administrators at Risk: Tools and Technologies for Securing Your Future, McKenzie, National Educational Service, Bloomington, IN, 1993.)

What is an open mind? A mind which welcomes new ideas. A mind which invites new ideas in for a visit. A mind which introduces new ideas to the company which has already arrived. A mind which is most comfortable in mixed company. A mind which prizes silence and reflection. A mind which recognizes
that later is often better than sooner. An open mind is somewhat like silly putty. Do you remember that wonderful ball of clay-like substance that you could bounce, roll and apply to comics as a child?

An open mind is playful and willing to be silly because the best ideas often hide deep within our minds away from our watchful, judgmental selves. Although our personalities contain the conflicting voices of both a clown and a critic, the critic usually prevails in our culture. The critic's voice keeps warning us not to appear foolish in front of our peers, not to offer up any outrageous ideas, and yet that is precisely how we end up with the most inventive and imaginative solutions to problems. We need to learn how to lock up the critic at times so the clown can play without restraint. We must prevent our internal critic from blocking our own thinking or attacking the ideas of others.

An open mind can bounce around in what might often seem like a haphazard fashion. When building something new, we must be willing to entertain unusual combinations and connections. The human mind, at its best, is especially powerful in jumping intuitively to discover unusual relationships and possibilities. An open mind quickly picks up the good ideas of other people, much like silly putty copying the image from a page of colored comics. The open mind is always hungry, looking for some new thoughts to add to its collection. The open mind knows that its own thinking is almost always incomplete. An open mind takes pride in learning from others. It would rather listen than speak. It loves to ask questions like, "How did you come up with that idea? Can you tell me more about your thinking? How did you know that? What are your premises? What evidence did you find?"

The open mind has "in-sight" - evaluating the quality of its own thinking to see gaps which might be filled. The open mind trains the clown and the critic to cooperate so that judgment and critique alternate with playful idea generation. Ideas have at least three major aspects which can usually be modified and improved:

1. Ideas are based upon premises of one kind or another. Many people come to their ideas (judgments or conclusions) without ever explicitly examining the premises which lie underneath those conclusions.Premises are basic beliefs which act for an idea as the foundation of a building or the roots of a tree. Collections of premises are often called assumptions or mind-sets (Drucker, 1992) or paradigms (Barker, 1992) or mental models (Senge, 1991). Sometimes our thinking comes to us already packaged without our even knowing which premises and assumptions lie below the surface, but an open mind knows that all such premises must be re-examined with some frequency to see if they are serving us well and truly match our basic belief systems.

2. Ideas are based upon evidence. Many of our ideas emerge from experience. We collect data, look for patterns and seek laws to help us predict the future. Unfortunately, we all too often collect evidence electively. Once people begin to hold an idea, research has shown that they begin to screen
out data which might create dissonance, evidence which might "call into question" the value of the idea. An open mind looks at the quality of its evidence with the same dispassionate attitude it applies to its premises and assumptions. Mindful of the three little pigs which built houses of straw, twigs and brick, the open mind seeks bricks and mortar which can withstand the huffing and puffing of the most aggressive wolf.

The open mind asks, "What evidence do I need to gather? Do I know enough? Has anything changed since I last gathered evidence? Is there new data? Is my data complete?"

3. Ideas are based upon logic. Our conclusions and ideas should flow from logical connections between our premises and our evidence. The open mind keeps asking of its ideas, "Is this logical? Does this makes sense? Does this follow from the evidence I gathered? Have I identified all the key factors?

* Seeing what’s missing

At times, the enormity of the data cascading into our computers creates the false impression that we have fully explored some topic. Experience shows that even when we have mountains of data, we may have missed really important articles or data because we encountered one of the following problems:

1) Flawed search strategies. We pick the wrong search term, one not included in the keyword lexicon of the particular database. Hitting few articles, we conclude that little has been written on that topic. Perhaps if we replace "instructional technology" with "educational technology" we will hit a rich vein of literature. We learn to doubt the efficacy of our search words and check the lexicons.

2) Biased databases. Even though we would like to believe otherwise, some groups and some aspects of history are systematically avoided or ignored by data sources. I recently searched an electronic encyclopedia in preparation for a third grade unit on Native Americans and found that the word "broken" never occurred in the same article with the word "treaty." In reading some of the articles which held the word "treaty" I was struck by the carefully sanitized phrasing of how tribes were relocated. The trail of tears had been expunged from most tribal histories.

3) Overloaded databases. Conducting a Veronica search of Gopherspace with the search term "technology" I encountered thousands of articles. Scrolling through the first several hundred titles, I noted a huge number of articles about technology in the timber industry. Why did this particular group dominate the first part of the list? I hypothesized that because much research in this nation has been funded by government and industry, the files presently available in university libraries may be the result of such projects. A student team browsing such a list might think they had hit the "mother lode" of data on timber management, but they need to identify the
source and know that balance can only be achieved by seeking what is missing. What data would emerge in a search of databases provided by environmental groups?

4) Wrong database. Even though gopher programs and knowbots are linking users to multiple data sources without requiring customized scanning, these programs do not offer access to all appropriate databases. They may give the false impression of comprehensive coverage while actually missing key sources.

* Recognizing anomaly

Cyberspace provides a rich offering of anomalies (American Heritage Dictionary: deviation from the normal or common order or form or rule; abnormality). These anomalies can be a great source of inspiration and invention during times of rapid change. They are outstanding events. They stand as extra-ordinary. They are, by definition, out of the box. They maybe glimpses of our futures. Students can be taught to seek, capture and examine such irregularities, remembering that penicillin was discovered because of a laboratory error that grew a mold by accident. The Internet may offer many powerful accidental discoveries.

**Conclusion: Raising A Generation of Free Range Students**

What is a "free range student?" It is simply a student fed on the wild grains and fragments available in the magical world made accessible by the Net. Just as some gourmets prefer free range chickens to their plump cousins raised on processed grains and feed heavily impregnated with hormones and chemicals, the theme of this article is the value of raising children to think, explore and make meaning of their worlds for themselves. No more second hand knowledge. No more sage on the stage. Students will learn to make sense out of nonsense and order out of chaos. They will ask essential questions and solve complex problems. They will join electronically with brothers and sisters around the globe to cast a spotlight on earth-threatening issues which deserve attention and action.

The Net offers amazing freedom of access to information. But Info-Heaven can quickly become Info-Hell if we do not equip our students with the reasoning and exploration skills required to cope with Info-Glut and Info-Tactics. To a large extent, the value of cyberspace resides in the minds of the voyagers.