Handouts
Conroe School Library Media Specialists
Oct 10-11, 1994

Reading

Resource-based Teaching

Information Literacy

Your Mission

You have been asked by a member of the Conroe School District to defend the existence of full-time library media specialists in the district. The board wants to know what difference you already make and what your plans are to tailor your program to the needs of students and teachers in your building. You have ten minutes of board time to describe your plans.

Objective:
Achievement
Solution:
School Libraries

by David V. Loertscher

*Two reports show a
strong link between
school libraries and high
student achievement.*

D uring the 19th and 20th centuries, each generation in the United States sacrificed to educate the next as its contribution to the perpetuation of the American Dream. But as the 1990s roll on toward a new century, the nation is questioning the quality of our schools and their ability to provide the intended boost. So much bad press about the inadequacies of the school system has been ingested by the nation in the past 10 years that parents, educators, and government officials are asking how to repair or restructure it. Some view the problem as unsolvable.

What are the basic elements that must exist to provide a quality education? What are the enriching elements (the ones that are nice to have if you can afford them)? What are the extraneous elements (those that probably don't make a difference one way or another)? Is a teacher with 20 students and a few textbooks the basic element with every other aspect of the

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modern school a frill? Are the "add-ons" of art, music, physical education, vocational education, counseling, technology, and libraries really needed, or are these expensive features frills? Or worse, are these additional elements a drag on both the pocketbook and the job a single teacher can accomplish alone?

Such questions might be easy to answer if basic literacy were targeted at a single, achievable level, such as, "every student will exit school with a reading level of at least grade 6.2." But, the requirements of a complex society, an information society, a technological society, an economic giant demand more. On the one hand, many accept the premise that we must provide more, but when questions of quality arise, when it seems that nothing is working, then one begins to wonder again if a basics approach might be a good idea.

Two important studies, both published at the beginning of 1993, directly address the question of basics in education. One explores the contribution of the school library media center (SLMC) to achievement[1]; the other looks at the value of free voluntary reading.[2] Added together, these two studies provide clues about what's really essential in American education. They provide guidelines for program planning, action, and necessary expenditures to communities as they streamline or redesign their schools. Best of all, the research findings make sense.

In the 30 years that SLMCs have been a widespread part of schools in the United States, at least $80 billion

has been spent on them if you count facilities, materials, technologies, and personnel. Any time a budget crisis looms on the horizon, SLMCs come under scrutiny because they represent a substantial cost over and above the investment in a single teacher armed with a few textbooks. Has this investment paid off? The Colorado Department of Education study *The Impact of School Library Media Centers on Academic Achievement* and the report *The Power of Reading* by Stephen Krashen answer a thunderous *yes* to that question. But that answer must be tempered with a *yes . . . if* qualification, since a simple expenditure for space, materials, and technology is only a tool. It is easy to go to the store and buy a shovel, but that doesn't guarantee that a hole will get dug.

The Colorado Study

In 1987, School Match, a company helping business executives choose schools for their children as they relocate, reported that the strongest predictor of test performance for young children is school library media expenditures. Keith Lance, one of the authors of the Colorado study, was interested in confirming this finding for Colorado. He was also interested in identifying intervening variables that explain this relationship. Using a grant from the U.S. Department of Education, the Colorado study was planned and carried out in 1991-92 using data collected by the Colorado Department of Education during the 1988-89 school year.

Figure 1
U.S. & sample schools by level, 1988-89

U.S.

Elementary 51,339 — 62%
Other 7,832 — 9%
Middle 7,957 — 10%
Junior High 4,687 — 6%
Senior High 11,350 — 14%

SAMPLE

Elementary 134 — 61%
Other 1 — 0%
Middle 24 — 11%
Junior High 15 — 7%
Senior High 47 — 21%

Source: Library Research Service

Figure 2
U.S. & sample schools by enrollment range, Fall 1988

U.S.

500-699 16,685 — 20%
700-999 10,011 — 12%
1000+ 6,674 — 8%
300-499 23,359 — 28%
-300 26,696 — 32%

SAMPLE

500-699 40 — 18%
700-999 25 — 11%
1000+ 20 — 9%
300-499 73 — 33%
-300 63 — 29%

Library Research Service

Of the 1,331 schools in Colorado, 221 had sufficient comparable data to be included in the study. Comparing these sample schools to all schools in the state, the research team found them sufficiently representative. Then, comparing the Colorado sample to the schools of the nation, the Colorado schools again seemed typical with regard to composition by grade level and enrollment size. (See Figures 1 and 2.)

Data collected from state Department of Education files about the schools in the study included information about:
- the community and the size of the at-risk student population;
- the teacher-pupil ratio in the school;
- the salaries, years of experience, and degree levels of the teaching staff;
- the total expenditures per student for the entire school.

Data studied specific to school library media centers included:
- the size of the SLMC collection including books, periodicals, and audiovisual materials;
- the amount of involvement of the SLMC staff in assisting students and teachers to use the SLMC facilities and collection;
- the amount of use the SLMC received;
- the use of microcomputers in the school;
- the total expenditures for the SLMC in each school.

Using a variety of statistical techniques, including factor and correlation analyses, the Colorado researchers studied the influence of these community, school, and media center variables on standardized test scores in reading, language, and information skills. For grades one, two, four, five, and seven, *Iowa Tests of Basic Skills* (ITBS) scores were used; for grade ten, scores on the *Tests of Achievement and Proficiency* (TAP) were studied.

Findings of the Study

The Colorado study shows that the strength of the SLMC is a clear predictor of academic achievement. At every grade level studied, as an SLMC's staff and collection increased, test scores increased. The only other factor in the study to show such a strong effect on achievement was the presence of student at-risk conditions, such as poverty and low educational attainment among adults in the community. In fact, when the negative force of these factors is pitted against the strength of the SLMC factors, an interesting tug of war occurs. Academic achievement is being dragged down by at-risk factors in students' backgrounds at the same time that SLMC staff and collection size are pushing academic achievement up.

Supporting evidence of this relationship further, the study found that even among communities with similar economic conditions, those with better SLMC funding fostered higher student achievement: "Students at schools with better funded SLMCs tend to achieve higher average test scores, whether their schools and communities are rich or poor and whether adults in the community are well or poorly educated."

When combined, these two factors, at-risk conditions and SLMCs, account for a great deal of the variance in reading scores across the grade levels. (By tenth grade, they account for more than three-quarters of this variance.)

Two additional factors associated with SLMCs were also found to help predict academic achievement in a more indirect way: the size of the SLMC budget and the role of the library staff in the school. The study concludes that, in the case of school library media materials, "you get what you pay for" in student achievement. Also, when the school library
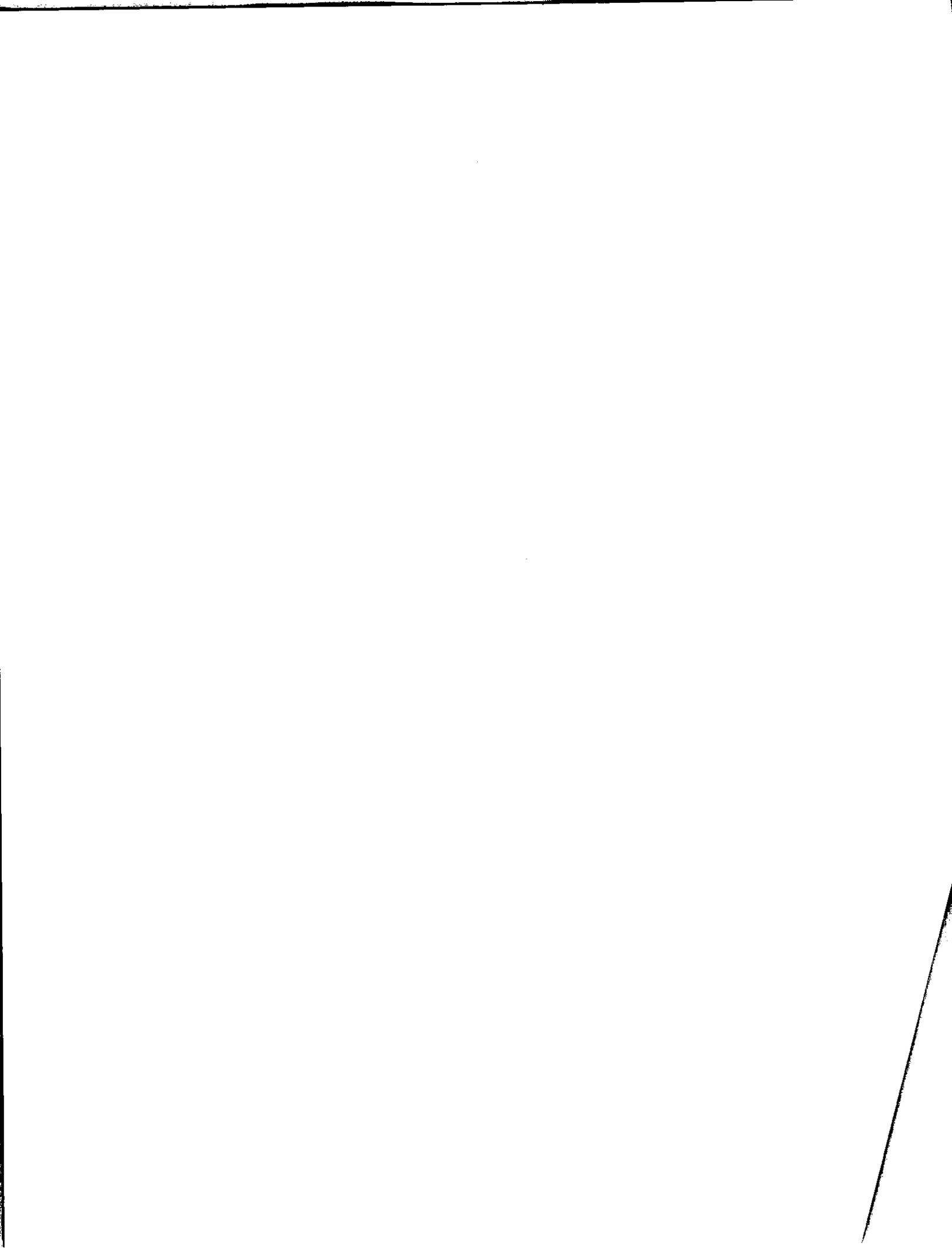
Figure 3 and Figure 4 content:

Figure 3
Summary of conclusions from Colorado study

- The size of an SLMC's staff and collection is the best school predictor of academic achievement.

- Among school *and* community predictors, the size of the SLMC staff and collection is second only to the absence of at-risk conditions, particularly poverty and low educational attainment among adults.

- Students who score higher on standardized tests tend to come from schools with more SLMC staff and more books, periodicals, and videos—regardless of other factors, including economic ones.

- The instructional role of the school library media specialist shapes the collection and, in turn, academic achievement.

- School library media expenditures affect SLMC staff and collection size and, in turn, academic achievement.

Figure 4
Findings from *The Power of Reading*

- Voluntary reading is the best predictor of reading comprehension, vocabulary growth, spelling ability, grammatical usage, and writing style.

- Access to SLMCs results in more voluntary reading by students.

- Having a school library media specialist makes a difference in the amount of voluntary reading done.

- Larger school library collections and longer hours increase both circulation and amount read.

Figure 5
"The Power of the SLMC"

RESOURCES:
1. A large SLMC collection
2. A full library media staff
3. Access to public libraries
4. Adequate SLMC budgets

TECHNIQUES:
1. Reading aloud
2. Sustained silent reading
3. A print-rich environment
4. Encouragement
5. Reading models (family, friends, teachers, school library media specialists)
6. Resource-based teaching

AMOUNT READ

READING ACHIEVEMENT IMPROVED:
Reading Comprehension
Grammar
Spelling
Writing style
Vocabulary

read and language ability. These include having more resources available at home, larger collections of books in classrooms, and—of course—bigger and better school and public libraries.

For a summary of the findings from Krashen's report relating to school library media collections and their effect on reading, see Figure 4.

Combining Both Studies

When we combine the Colorado study and the Krashen review of research, a powerful model appears that can become the basis of a solid reading program for schools. (See Figure 5.) Simply put, adequate SLMC budgets, materials, and staffing, as well as techniques that encourage the effective use of library resources, lead to higher student achievement.

Not only are the two studies a powerful argument for the support of strong library media programs as an essential component in every school, but they put the burden of proof back on those who claim the contrary. It is doubtful that any evidence can be mounted to show that good library media programs don't make a difference. □

References

1. Lance, Keith Curry, Lynda Welborn, and Christine Hamilton-Pennell. *The Impact of School Library Media Centers on Academic Achievement.* Hi Willow Research and Publishing (1993; ISBN 0-931510-48-1; $25), P.O. Box 266, Castle Rock, CO 80104.
2. Krashen, Stephen. *The Power of Reading.* Libraries Unlimited, Inc. (1993; ISBN 1-56308-006-0; $13.50), P.O. Box 6633, Englewood, CO 80155-6633.

media specialist joins with the teacher to exploit the resources of the library media collection, this kind of cooperative effort pays off in better test scores.

A summary of conclusions from the Colorado study appears in Figure 3.

Reading Power

What could account for the power of the SLMC to predict academic achievement? In one sense, we could theorize that administrators of school districts who care enough to have strong school library media programs also care enough to set an entire program in place that affects academic achievement. In this view, the library media program is a symptom of other good things happening.

The research review done by Stephen Krashen in his book *The Power of Reading* provides another logical explanation. Krashen reviews hundreds of research studies done in the 19th and 20th centuries that explore the power of free voluntary reading— the kind of reading a young person is not assigned to do, but rather chooses to do. Krashen's summary is not only

insightful, but when possible, he has reanalyzed experimental data with current statistical tools to recheck the results of previous studies.

Krashen makes an utterly startling conclusion (with tongue in cheek): we learn to read by reading! If we are trying to learn a second language, the best results happen if we read in that language (good advice for all the students in our schools who must learn English). But Krashen found even better and more powerful results: that free voluntary reading is also the best predictor of reading comprehension, vocabulary growth, spelling ability, grammatical usage, and writing style.

Given all these benefits, it follows that a major goal of education should be to make sure that children do as much of this kind of reading as possible. The best way, according to Krashen, is to ensure access: "The research supports the commonsense view that when books are readily available, when the print environment is rich, more reading is being done." Krashen goes on to cite ways in which children's access to books is increased, thus affecting the amount

LIBRARY MEDIA SPECIALISTS AND THE CURRICULUM

Hints from the Research

What does the research say from the teaching disciplines? What do scholars and researchers say should be taught, how it should be taught, and what types of activities should be conducted?

Reading

1. The amount read is critical.
    a. Flood young people with reading materials.
    b. Provide time to read, i.e., SSR, making reading something desirable when there is spare time.
    c. Promote the amount read through contests special events, individual goal setting, etc.

2. Listening to well-read stories helps.
    a. Learn to read out-loud effectively and do it often.
    b. Use storytelling whenever possible.
    c. The use of tape recorded stories may help.
    d. Create programs that encourage oral reading by teachers to students on a daily basis.

3. Parental involvement helps.
    a. Encourage parents to be role models: reading themselves, having reading materials easily available at home; talking about reading, etc.
    b. Involve parents in reading motivational activities.

4. Read significant works, not necessarily the classics.
    a. Encourage reading the best of all genres, but not necessarily the classics.
    b. Encourage reading for pleasure.
    c. Build analysis of literature.
    d. Don't kill literature with over-analysis.

5. Explore values in literature.
    a. Encourage the reading of good literature which explores values.
    b. Discuss literature in various group sizes and settings.

6. Integrate reading with listening, speaking, writing.
    a. Create dramatic experiences with literature: choral speaking, readers theater, dramatic productions.
    b. Use literature as a springboard to writing in any curricular area.
    c. Give opportunities for young people to share literature orally with others.

7. Cause students to think as they read.
    a. Discuss literature in various group configurations. Use both content oriented questions and questions that require interpretation and synthesis of what has been read.
    b. Design one-on-one reading experiences with plenty of discussion both for analysis and enjoyment.

8. A phonics program is important.
    a. Assist early grade teachers in the phonics program effort by helping to create fun activities involving word sounds through literature (alphabet books, books featuring word sounds).

9. All teachers should motivate students to read.
   a. Organize, plot, encourage, build, push, and create motivational strategies that involve everyone in the school.
   b. Analyze non-participation by some teachers and create strategies to encourage support.

10. Build comprehension.
    a. Engage in discussion of literature.
    b. Encourage choral reading.
    c. Promote readers theater.
    d. Experiment with debates.
    e. Create any activity which has as its antecedent the understanding of written material.

11. Encourage a diversity of genres.
    a. Build a variety of literary genres into storytelling sessions, oral reading programs, motivational reading strategies, and curricular units.

12. Over-the-summer reading helps retain learning.
    a. Sponsor a reading motivational program for summers or breaks.
    b. Cooperate with public libraries in summer reading programs.

13. Ownership of books is important.
    a. Develop strategies to encourage book ownership such as RIF programs, book sales, etc.
    b. Encourage young people to write and "publish" their own writing.

14. Provide alternatives to the ubiquitous book report.

Source: "Research on Reading" by David V. Loertscher. In: Woolls, Blanche. *The Research of School Library Media Centers.* Hi Willow Research and Publishing, 1990. (available from Hi Willow at P.O. Box 266, Castle Rock, CO   80104)

See also:

Krashen, Stephen. *The Power of Reading.* Libraries Unlimited, 1993.

Count on Reading
Boosting the Achievement
of America's Youth

Count on Reading, a project of the American Association of School Librarians, challenges schools, libraries, and communities to help build a nation of readers by participating in one or both of the projects described below.

The First Billion Books

What is it?
Count on Reading, The First Billion Books, challenges the youth of the nation over a long period to:
- Build a reading habit
- Enjoy reading
- Improve academic achievement
- Read enough to improve:
  - Reading comprehension
  - Vocabulary growth
  - Spelling accuracy
  - Grammar
  - Writing ability

Who should participate?
Any organization, including schools, public libraries, professional organizations or clubs.

Why participate?
Avid readers have the best chance to excel in the information society. Wide reading builds bridges across a multicultural society. Count on Reading will connect all current reading motivational programs to build consistent reading habits across time.

How do we participate?
To receive an official registration form and instructions, send a SASE and:
Contact person's name
Organization name
Address
Telephone number
to:
Count on Reading
Marjorie Horowitz
10 Prospect Ave.
Montclair, NJ 07042-1915

The Research

What is it?
The research allows schools or organizations to test the power of reading initiatives. Do they really make a difference in:
Academic Achievement
Comprehension
Spelling
Vocabulary
Writing
and Grammar?

Who should participate?
Any organization that conducts a reading initiative over a long period of time and where readers are reading large amounts.

Why participate?
National research indicates that free voluntary reading is an extremely powerful predictor of excellence. Can you show that power in your community?

How do we participate?
To receive an official registration form and instructions, send a SASE and:
Contact person's name
Organization name
Address
Telephone number
to:
Count on Reading - The Research
David V. Loertscher
P.O. Box 266
Castle Rock, CO 80104

The American Association of School Librarians is a division of The American Library Association

Count on Reading
• The First Billion Books •

Count on Reading, The First Billion Books is an umbrella reading initiative sponsored by the American Association of School Librarians. It challenges the young people of the nation to read a billion books, knowing that readers who read their share will have developed life-long reading habits. Avid readers have a driver's license for the information highway. Those who enjoy reading enough to read often, according to Dr. Stephen Krashen in a review of 100 years of reading research[1] , are superior in:
- Reading comprehension
- Vocabulary
- Spelling
- Grammar
- Writing style

Count on Reading does not seek to replace any reading initiative currently planned or in progress; rather, it seeks to build consistency over time, to put various short-term initiatives into a longer one—long enough and consistent enough to actually build avid readers rather than short-term spurts that have lesser potential to affect long-term results.

Why should you participate?

Avid reading provides the best chance to succeed in the world of literacy and the information society. Helping to create a love of reading is the best gift that can be given during youth. Look around you. How many young people are avid readers? How many are excelling on standardized tests? How many young people *enjoy* reading even though they might be able to do it passably well? Skill-based reading has produced a nation of young people who can do only basic reading but they neither like it nor choose to do it very often.

Who can participate?

Any school, public library, organization, or community group can participate. In fact, Count on Reading will succeed in communities where a number of groups band together to create a long-term reading challenge as opposed to a short one-time initiative.

What if I am already a part of one or several reading initiatives?

Great! You're well on your way.

Count on Reading does not compete with any other reading initiative. It can be considered as an umbrella that concentrates on long-term motivation. It encourages groups to create a number of short-term initiatives that hook together so that young people get into the reading habit and maintain it. Children's choice awards, Book-It programs, summer reading programs, author visits—all should be planned as pieces of a larger picture. The goal is to build a community of readers in the home, the classroom, the school, the town, and nation.

What are some fun ways to stimulate reading?

One billion half-inch books measures the diameter of the earth! Can your group help do its part? Can you read your way across the classroom, down the hall, out the door, down the block, and on to city hall (or to a famous sports team, or to a celebrity door) as your contribution to the national effort? States might read across their state and then help readers in states like Nevada and Alaska. Everyone can help. Even one more book helps.

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[1] Krashen, Stephen. *The Power of Reading.* Libraries Unlimited, 1993 (P.O. Box 6633, Englewood, CO 80155. For hundreds of reading ideas, see *Reading Is Not a Spectator Sport* by Mary Pelton (same source).

Thermometers of reading will be published by city, state, and the entire nation to mark progress. Use these thermometers from the national Count on Reading Committee as motivators to have young people do their share and more. An example of a successful program is the two-year program of Dayton, Ohio when over two million books were read in a city-wide effort. Reading scores improved in the community, but when the reading challenge ended, scores began dropping again.

Dayton and other communities have found that school challenging school, and classroom challenging classroom developed enough motivation to capture student's attention. What will work in your area is really a local decision requiring creativity and cooperation.

What techniques are likely to produce long-term results?

The Krashen research points to a number of factors that have lasting value:
* Create a print-rich environment at home, the classroom, and the library.
* Provide unlimited access to materials from libraries.
* Allow young people to read what they like to read (including light reading and comics).
* Read aloud to young people every day (K-12).
* Use sustained silent reading as a tool.
* Models help (reading parents, teachers, librarians, etc.).
* Encourage reading (but extrinsic rewards may not be the best technique).

When does Count on Reading begin?

Count on Reading was launched by the state of **New Hampshire** in the Spring of 1994 and will continue for several years. Individuals, groups, and states can start immediately. National and state publicity will keep you abreast of progress. If you already have data from a project begun in the 1993-94 school year, submit that to the national committee.

How do we get started?

First, submit the following registration form:

Count on Reading Registration Form

Yes, I would like to be a member of the Count on Reading Initiative:

Names:
Title:
Address:
City, State Zip:

Telephone (daytime and evening)
Fax:
Electronic mail:

Do you already have a reading initiative (motivational program) in place?
    If yes, please complete the following:
    Dates of operation:
    # of participants:
    Very brief description of activities:

_____ Send me information on how to turn my reading motivation program into an action research project which measures my success.

Return this form to Marjorie Horowitz, 10 Prospect Ave., Montclair, NJ 07042-1915

Then, as you begin your reading initiative, link it to Count on Reading and submit your first monthly report. It's simple. Every month send the following information:

Our Count on Reading Monthly Report

Your Name

Your Organization Name

Address

City, State

Project Name (if one has been selected):

This report is for the month(s) of _____, Year _____

_____# of participants

_____# of books (or book equivalents) read

Comments/successes, news for the national committee (adorable anecdotes)

Mail to: Count on Reading, P.O. Box 266, Castle Rock, CO 80104
(please duplicate as necessary)

The national committee will compile statistics from the above form and present them nationally, at the state level, and to participating communities.

Why should we submit monthly reports?

The national committee will use the statistics to attract national attention to reading, libraries, and other sponsoring organizations. For example, we are asking Congress for money to buy books for young people. Wouldn't a guarantee that the books be read and literacy increased be a powerful incentive to the national government? The national committee will also recognize organizations that achieve and surpass their goals.

Why are "books" being counted?

Actually, any reading can be counted. We chose books as easily counted items. We don't care what formulas are created to translate any type of reading to "books." But we do encourage local organizations to define something that makes sense in their local initiative. It is important that readers be allowed to choose material they want to read. Consistent reading on a regular basis is the key factor—and large amounts won't happen unless there is some enjoyment along the way. You can create local formulas to convert newspaper or comics reading to "books." Do what makes sense for your group.

Do we need to offer prizes?

Extrinsic motivation helps sometimes but at other times it can backfire. There are many motivational strategies that don't involve money, food, etc. Simple recognition, celebrity visits, and **the reading itself** are often sufficient. A variety of approaches is probably the best idea. Hundreds of ideas are presented in the literature and good brainstorming sessions will probably produce the desired techniques. Young people themselves are good sources of ideas.

What kind of reading should be counted?

All kinds of reading—books, magazines, computer books, newspapers, comic books, textbooks, books listened to (a teacher reading a book aloud to 30 students can count as 30 books), etc.

How will I know that our reading initiative makes a difference?

If you would like to conduct some locally-based research which demonstrates the power of free voluntary reading, send a self-addressed stamped (52¢) business envelope with your name and address to: **Count on Reading—The Research** at P.O. Box 266, Castle Rock, CO 80104 and you will be sent a description of simple studies you can do.

Suppose I would like additional training?

Training sessions for Count on Reading and the accompanying research project will be given at the following times and locations:

American Library Association. Miami Conference, Summer, 1994 (check program)
AASL National Conference, Indianapolis, November, 1994 (check program)
Count on Reading National Teleconference, Oct. 8, 1994, (Dave Loertscher and
Blanche Woolls as leaders) sponsored by Dan Barron, University of South
Carolina College of Library and Information Science, Columbia, SC 29208
Write for details and site arrangements.
State training sessions will be conducted at some state conferences. Watch your
mail and state association news.

Can the national committee of Count on Reading use my help?

Please. Send your name to Marjorie Horowitz (10 Prospect Ave., Montclair, NJ 07042-1915). You might even suggest ways you might help, but we also have many tasks that need interested persons.

Count on Reading
• The Research •

Count on Reading: The Research is a project of the American Association of School Librarians that allows schools or organizations to test the power of reading initiatives. Do they really make a difference in academic achievement, reading comprehension, spelling, vocabulary, grammar, and writing style? These differences were noted in a review of 100 years of reading research by Stephen Krashen in his book *The Power of Reading.*[1] Sometimes people will not believe a review of research—wondering if a similar impact would occur in their community or school. This project encourages the replication of research to justify the tremendous effort often put into reading initiatives.

Who can participate?

Any school, public library, organization, or community group can participate.

What model action research studies might I use?

Adapt one or more of the following six models to your situation. If you are not experienced in conducting action research, you may want to solicit advice or guidance from a person in your local area who is.

Where else can I get advice?

The Research Committee of the American Association of School Librarians stands ready to offer advice to any school or library wishing to conduct research. Write Sue Eason, who is the current chair of the research committee at Faculty of Library Science and Information Science, 140 St. George St., Toronto, Ontario, M5S 1A1, Canada.

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Count on Reading National Teleconference, Oct. 8, 1994, (Dave Loertscher and Blanche Woolls as leaders) sponsored by Dan Barron, University of South Carolina College of Library and Information Science, Columbia, SC 29208 Write for details and site arrangements.

State training sessions will be conducted at some state conferences. Watch your mail and state association news.

Should I report my work?

Certainly. Reporting locally the results of your work is a must. The national committee of Count on Reading would also appreciate brief reports on your work. Send them to: David Loertscher, P.O. Box 266, Castle Rock, CO 80104.

What if I find negative results?

You may well get negative findings. These might stem from a number of problems. For example, the amount of reading done may not have been sufficient to see positive results. The groups that you compare might be different in some significant way. Natural growth in reading maturity by those not participating in reading initiatives might account for problems. Young people who say they read may not have. Your method of

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[1] Krashen, Stephen. *The Power of Reading.* Englewood, CO: Libraries Unlimited, 1993.

study might be faulty. It is important to try to find out why you got the results you did. You may discover some critical problems to avoid when repeating the study.

What should I do to prepare to study the impact of reading?

Alert: Make the Treatment as Strong as Possible! There are some aspects of any program which must be in place if a difference is to be guaranteed:

1. The amount read must increase and be maintained at a high level for 6-12 months at a minimum. Actual time spent reading is the key. Public libraries conducting summer reading programs of 3 months duration can expect youth to maintain reading proficiency over that period and in some cases increase only if the person hasn't been much of a reader before participating (however that is a great victory).

2. Youth who have not read much or who are learning English and who participate in a free voluntary reading initiative are likely to benefit the most. Avid readers will maintain their excellence but probably won't increase by leaps and bounds.

3. The main techniques to increase the amount read are:
   a. Provide a print-rich environment (lots of easy access to a mountain of interesting reading material). Are there rotating classroom collections from the main library? Can students take home an unlimited number of books and exchange them daily? Are there attractive displays of books that can be checked out? Are paperbacks readily available? Are there trade shelves available? Are comic books available? Would youth report that there is something they'd like to read close by? Are homes stocked with reading materials? Are popular periodicals and newspapers available? Can they be checked out? Do you have a large collection of interesting and up-to-date books that youth will read? Current biographies? Sports books? Popular fiction? Thin books? Books for at-risk readers?
   b. Read aloud to youth every day for a minimum of 15 minutes (K-12).
   c. Provide sustained silent reading time (at home, at school, in the library). At least 30 min. per day would help.
   d. Provide encouragement to readers (programs, initiatives, challenges, etc., but not necessarily prizes, food, etc.) What works is the criteria of choice here. And, what works today may not work tomorrow. Do computer programs help youth pick new titles to read? Do librarians help youth pick new books to read? Booktalks? Book discussions? Brown bag lunch discussions? Visits by famous people in the community/state/nation who talk and read books? Night of a Thousand Stars celebrations? Night camping in the library?
   e. Try to make reading a pleasant experience (it's cool, discussions, a community of readers, heroes do it--so do we)
   f. Participation by families will help.

4. It doesn't make a great difference what is read as long as reading happens. Starting with interests and building from there is probably an important aspect of any program. Start with interests, gently challenge with quality.

Method One
(Preliminary Study)
Test the Theory for Yourself

Method One
(Preliminary Study)
Test the Theory for Yourself

One good way to get started is to test some of the national research conclusions in your own school or library using existing data and existing students.

Assumption: Avid readers (young people who read regularly and enjoy it) will score higher on achievement tests than students who don't read much or who can't read very well.

1. Compile a list of students (20 would be plenty for a trial) that you know are avid readers.

2. Get their test scores on reading comprehension or their overall achievement scores.

3. Average the scores.

4. Compare this average with the average for all students in the school. Is it higher? How much higher? High enough to brag about?

5. Share Your Findings: In your preliminary investigation(s), what did you find? Did you draw any conclusions? Did you gain any confidence to conduct a formal piece of action research?

Method Two
Start with Individual Readers

Each student who gains the reading habit and becomes an avid reader is one more literate young person with a chance for success.

Try a pilot study
1. Within a group of young people to whom you have access, interview students, teachers, and parents. Rate each person along the continuums:

Seldom reads	1	2	3	4	5	Avid reader
Doesn't read well	1	2	3	4	5	Reads very well
Hates to read	1	2	3	4	5	Loves to read

2. Set up a model literate environment in cooperation with teachers and parents over an entire school year. Include easy access to reading materials, reading aloud, motivational strategies, SSR...etc.

3. Monitor progress with individual interviews every quarter, rating each student on the continuums.

4. What change is there over time? What techniques have produced the best results?

5. Examine failures carefully. What are the expressed problems? Underlying problems?

6. Publicize positive results. Seek input for improvement from many sources.

7. Use the pilot study to launch a larger program with a better chance of success. (Don't forget the original pilot group - keep it going).

Institute a larger program/research study

1. Gain support from a wide variety of interested people to initiate a larger program/research study, the goal of which aims at individuals rather than groups.

2. Plan with the group the structure of a program that will be long-range, not a quick fix.

3. Plan ways to monitor success with individuals as opposed to group averages.

4. Plan a variety of approaches that will stimulate interest in reading over the long haul.

5. Carry out the program.

6. Build in monitoring checks on a regular basis and insist that the program evolve over time but not be diverted from its original intent.

7. How many individual avid readers are created? Maintained over time?

8. Share success stories and challenges with the Count on Reading Committee, parents, the community, the profession.

Method Three
Increasing the Amount Read and Declaring Success

Method: Create a reading initiative that results in more reading than previously done by the participants. Sustain this effort over time. Declare success based solely on the Krashen research. You might interview some participants in the initiative and ask them if they are enjoying reading more, what books they enjoyed, and whether they are willing to participate in the next phase of the initiative. Use these interviews in your news stories of the project. Report your project to Count on Reading.

Examples:

A sustained silent reading program is begun and lasts all year. A report for the local news and the school board describes the program laced with experiences from students and teachers who participated.

A public library goes into a preschool and starts a read-aloud program. Sometimes the staff of the preschool reads and sometimes the library staff comes and reads, but the read-aloud program happens every day. The staff and the librarians observe increased interest by the children in books and reading and report this to the community and to the Count on Reading national committee.

Four teachers in a school building did not participate in the read-aloud initiative last year. The school librarian convinces them to do so this year and helps choose some good books, participates when possible, and monitors progress. The 100% success rate is touted in PTA meeting. Benefits that have accrued (based on Krashen) are presented.

A school decides to purchase a computerized readers advisory program. The children are constantly at the computer getting suggestions on what to read next. Circulation triples. The librarian declares the project a success in the local news complete with quotes from the kids.

A group of teachers and librarians decided to abandon the reading text and use literature instead. They work all year to find great books the children will enjoy, create activities which increase the enjoyment of the literature, and create a "community of readers." After interviewing the children and parents, they realize and report the vast difference in reading purely from an enjoyment point of view (the skills have developed almost without effort, but that is only a minor part of why the program was changed).

Method Four
Push Reading, Measure Once, Compare against Expectations

Assumptions: Students who are tested are expected to progress one grade level each year on standardized tests of reading. The number or percentage of students at or above grade level is often of interest to teachers and parents. If you can use the results of a single reading test at the conclusion of a reading initiative (for example, the normal spring skill tests in the public schools), you can usually obtain the scores of how a group of students are doing in reading. For some reason, you may not have comparable test scores for the group of young people you are including in your reading initiative. In the affective area, you could assume that in a normal group of young people, the majority would not list reading as one of their preferred activities.

Method: Ask young people as they enter your reading initiative to fill out a general questionnaire about things they like to do in their spare time. They might rate television, sports, hangin' out, reading, etc.
    Conduct your reading initiative.
    At the conclusion of the initiative, administer a test of reading skills and a final questionnaire about things they like to do in their spare time. Do before and after interviews with a random sample of young people about use of leisure time.

Evaluative questions: How many students are at or above grade level in reading skill? What percentage of the students are at or above grade level in reading skill? How many young people rate reading higher on their list of things they like to do in their spare time? In student interviews, how many students mention reading during exit interviews as compared with those who mentioned it when they were interviewed the first time?

Examples:
    A school has test scores for a new test only in 4th and 6th grades. The entire school participates in the reading initiative. The scores for 4th and 6th grades are examined to see if they are on grade level or above. Results are reported in the local news and in library periodicals.
    The public school targets a group of at-risk readers for a special after-school or Saturday reading club. The public and school librarians ask and receive permission to examine the year-end school scores of the participating students to see if they are achieving grade level scores. A special Night of a Thousand Stars celebrates success.
    The public library has access to a reading test. Students who sign up for a reading program can, as an option, take Form A of the reading test at the beginning of the program and Form B at the end of the program. What progress was made? More than expected?
    A parent, Mrs. Johnson, is worried about Jane's progress in reading. After a planning session with school and public librarians, a special reading incentive/read-aloud/SSR program is designed around Jane's interests. Progress is monitored. Does she achieve expectations? Jane gets to have lunch with a celebrity (local/state/national).
    A principal implements a school-wide program of reading by challenging the whole school to read 50,000 books by year's end. A success would entail the principal spending a day on the roof of the school, kissing a pig, coming to school in his pajamas, etc. Reading scores are examined to check the percentage of students at or above grade level.

Push Reading, Measure, Compare Against Another Group

Assumptions: You may have access to reading scores of last year's 6th graders (any grade or all grades) but not for this year's 6th graders that they took at the end of the 5th grade. It may be too difficult to get individual scores for those in this year's 6th grade (kids move around, not enough time, too expensive, the school won't let you have access without major parent permissions, etc.) So all you may know is that the average 6th grader last year read at a 5.8 reading level; that is, they were below reading level slightly. You have no reason to suspect that this year's 6th graders are any different from last year's 6th graders. You also know that last year's 6th graders were encouraged to read about the same as they always had been, but that no extra special push on reading had occurred.

A second scenario might be two comparable schools in the same year. One school is going to participate in the reading initiative and the other school is not. Looking at last year's published scores for both schools, they don't differ very much from each other significantly (a judgment call, not a statistical test). One school becomes the experimental school and the other, the control school. Teachers and librarians in the control school can encourage reading just as they have done in the past. A major reading initiative will be conducted in the experimental school.

Method: Before the reading initiative, conduct random interviews of young people in the two schools about the use of their leisure time. Obtain reading scores for last year's 6th graders or last year's students in both schools.

Conduct the reading initiative in one school but not the other.

Obtain reading scores for this year's 6th graders or for students in both schools.

Conduct an exit interview with the same students in both schools about the use of leisure time. If you are doing the 6th graders, you will only have one group's response to this interview.

Evaluative questions: How do this year's 6th graders perform on reading skill tests as compared with last year's 6th graders? (at least as good or better?). How does the experimental school perform on reading skill tests as compared with the control school? (at least as good or better?). How many young people rate reading higher on their list of things they like to do in their spare time in the experimental school vs. the control school? In student interviews, how many students mention reading during exit interviews as compared with those who mentioned it when they were interviewed the first time? (this year's 6th graders only)

Examples:

Of the three 2nd grade classes, two teachers participate in reading aloud and sustained silent reading programs every day for an entire year. There is no reason to suspect that the classes differ significantly from each other at the beginning of the school year. All classes participate in a reading initiative program. The scores of students at the end of the year are compared. Any differences?

One school district creates a massive reading initiative project. A comparative district does not. After a complete year, scores for the district as a whole are compared.

In a rural community the public library sends a thousand books to add to the school library collection for one year to support a massive reading initiative. They also supply storytellers, programs and other support for the initiative. Scores for the school are compared with scores from another school that did not receive the help from the public library.

Method Six
A Formal Reading Research Study

The design of a formal reading study that has true random samples, highly controlled reading initiatives, a true control group, and comparable reading tests and scores requires research design expertise, statistical advice, and professional data analysis. We suggest that public and school librarians find research groups or professors at local or state institutions who would be willing to provide such expertise. Major funding for such research is not a prerequisite for a quality study. Results of such studies should be reported in local, state, and national publications and reported to Count on Reading.

ONGOING PROGRAM

Small group
center activities

Small group research
LMS, teacher, or self
supervised

Individual/small group
production activities

CENTRAL PROGRAM
(resource-based teaching)

Teacher/staff supervised
large/small groups

School-wide Themes

Small group computer
writing/publishing

Grade Level Themes

Individual enjoyment
activities

Individual Units

Individual/small group
silent reading/studying

One-on-one help/
tutoring

Individual/small
group viewing/
listening

Individual book
check-out
(all grades)

Individual
student
research

AASL

American Association of School Librarians

FLEXIBLE SCHEDULING

Schools must adopt the educational philosophy that the library media program is fully integrated into the educational program. This integration strengthens the teaching/learning process so that students can develop the vital skills necessary to locate, analyze, evaluate, interpret, and communicate information and ideas. When the library media program is fully integrated into the instructional program of the school, students, teachers, and library media specialists become partners in learning. The library program is an extension of the classroom. Information skills are taught and learned within the context of the classroom curriculum. The wide range of resources, technologies, and services needed to meet students' learning and information needs are readily available in a cost-effective manner.

The integrated library media program philosophy requires that an open schedule must be maintained. Classes cannot be scheduled in the library media center to provide teacher release or preparation time. Students and teachers must be able to come to the center throughout the day to use information sources, to read for pleasure, and to meet and work with other students and teachers.

Planning between the library media specialist and the classroom teacher, which encourages both scheduled and informal visits, is the catalyst that makes this integrated library program work. The teacher brings to the planning process a knowledge of subject content and student needs. The library media specialist contributes a broad knowledge of resources and technology, an understanding of teaching methods, and a wide range of strategies that may be employed to help students learn information skills.

Cooperative planning by the teacher and library media specialist integrates information skills and materials into the classroom curriculum and results in the development of assignments that encourage open inquiry.

The responsibility for flexibly scheduled library media programs must be shared by the entire school community. THE BOARD OF EDUCATION endorses the philosophy that the library program is an integral part of the district's educational program and ensures that flexible scheduling for library media centers is maintained in all buildings and at all levels.

THE DISTRICT ADMINISTRATION supports this philosophy and monitors staff assignments to ensure appropriate staffing levels so that all teachers, including the library media specialists, can fulfill their professional responsibilities.

THE PRINCIPAL creates the appropriate climate within the school by advocating the benefits of flexible scheduling to the faculty, by monitoring scheduling, by ensuring appropriate staffing levels, and by providing oint planning time for classroom teachers and library media specialists.

THE TEACHER uses resource-based instruction and views the library media program as a integral part of that instruction.

THE LIBRARY MEDIA SPECIALIST is knowledgeable about curriculum and classroom activities, and works cooperatively with the classroom teacher to integrate information skills into the curriculum.

Adopted June, 1991
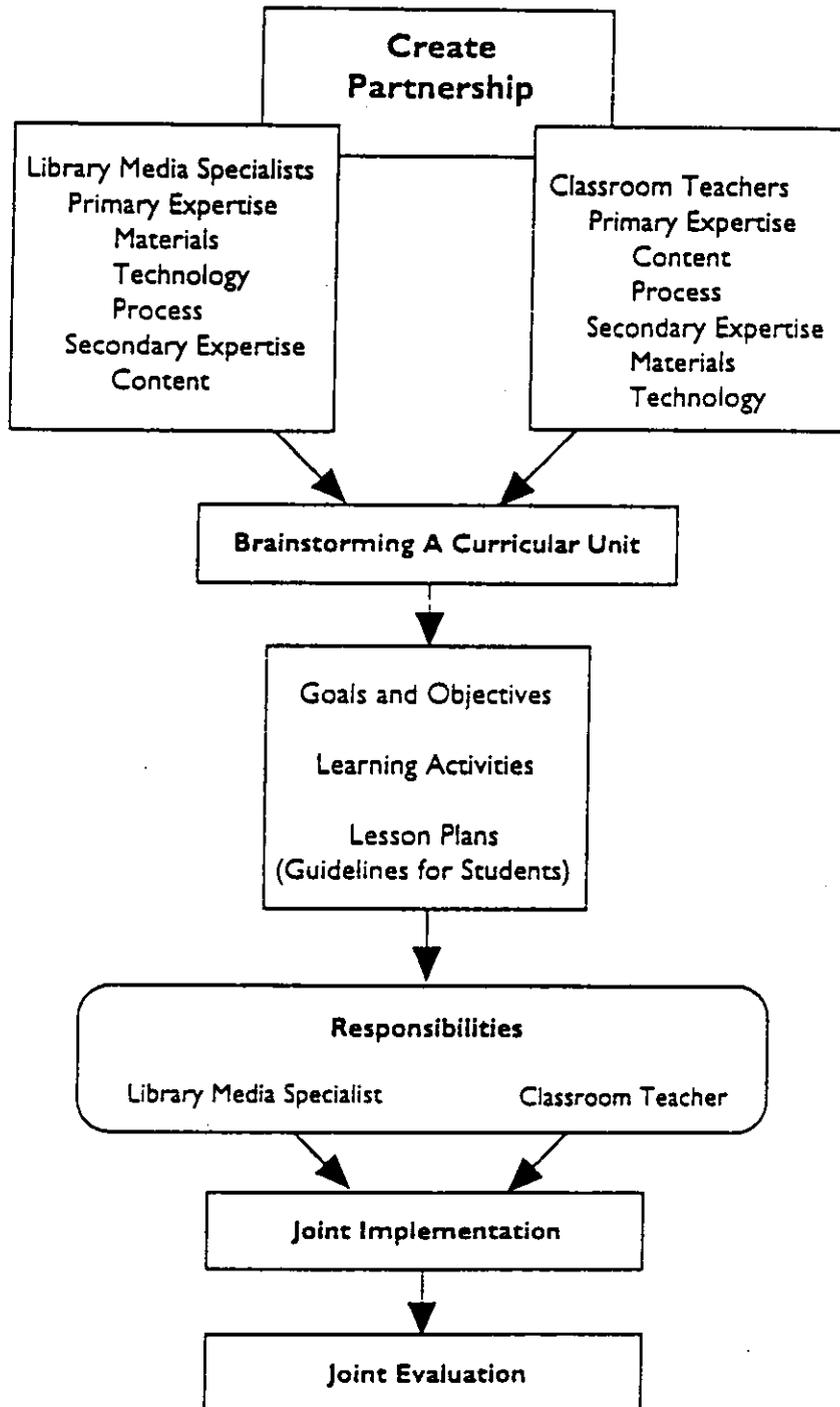
Curricular Partnership Planning

```
                    ┌─────────────────┐
                    │     Create      │
                    │   Partnership   │
                    └─────────────────┘
   ┌──────────────────────┐      ┌──────────────────────┐
   │ Library Media Specialists │  │ Classroom Teachers   │
   │    Primary Expertise      │  │   Primary Expertise  │
   │       Materials           │  │      Content         │
   │       Technology          │  │      Process         │
   │       Process             │  │  Secondary Expertise │
   │   Secondary Expertise     │  │      Materials       │
   │       Content             │  │      Technology      │
   └──────────────────────┘      └──────────────────────┘
                    ↓              ↓
         ┌──────────────────────────────┐
         │ Brainstorming A Curricular Unit │
         └──────────────────────────────┘
                        ↓
              ┌──────────────────────┐
              │  Goals and Objectives │
              │                       │
              │  Learning Activities  │
              │                       │
              │     Lesson Plans      │
              │ (Guidelines for Students) │
              └──────────────────────┘
                        ↓
      ┌────────────────────────────────────┐
      │           Responsibilities          │
      │ Library Media Specialist   Classroom Teacher │
      └────────────────────────────────────┘
                   ↓          ↓
              ┌──────────────────────┐
              │ Joint Implementation  │
              └──────────────────────┘
                        ↓
              ┌──────────────────────┐
              │   Joint Evaluation    │
              └──────────────────────┘
```

Chart developed for this publication by David Loertscher.

Resource-Based Learning:
What Does It Look Like?

Learning Resources

Technology
Video/ITV
Filmstrips
Audio
Computers
Videodiscs
CD ROM
Telecommunications
Other

Print
Books
Magazines
Newspapers
Textbooks
Pamphlets
Maps
Other

Places
Universities
Schools
Libraries
Museums
Zoos
Communities
Other

People
Classroom teachers
Library media specialists
Parents
Experts
Resource people
Other

Resource-Based Learning

Student at center
Uses resources to broaden learning base

Classroom teachers and library media specialists function as facilitators of learning:

Structure learning environment...

- Establish learning objectives
- Select/preview resources to ensure suitability for learning/learners
- Design learning experiences
- Set task-oriented assignments
- Create engaging problems

Facilitate student learning...

- Question to stimulate thinking
- Guide students to identify their own information needs
- Prompt to facilitate understanding
- Assist to ensure that students receive help with learning when/where necessary

Track and assess student learning...

- Record student's level of cognitive processing
- Record development of information literacy skills
- Evaluate how students use learning resources
- Evaluate student achievement of learning objectives
- Evaluate products

From: CMLEA

Checklist of Types of Media to Use in Instruction

Printed Media
Books
Picture books
Encyclopedias
Paperbacks
Literature
Textbooks
Ephemera
Pamphlets
Clippings
Graphics
Pictures
Charts
Maps
Paintings
Periodicals
Magazines
Newspapers

Miscellaneous Media
Games
Field trips
Learning centers
Bulletin boards
Dioramas
Kits

Audiovisual Media
Visual
Transparencies
Film
Audio
Records
Radio programs
Video
ETV
Videotapes

Computer Media
Drills
Simulations
Computer-assisted teaching
Databases
Interactive CAI
CD-ROM

Human Resources
Body language
Resource persons
The voice (for storytelling, dramatic reading)

Realia
Animals
Artifacts
Rocks and minerals

Checklist of Types of Teaching Activities

Browsing
Silent reading
Analyzing
Brainstorming
Thinking
Taking notes

Demonstrating
Experimenting
Discovering
Simulating
Experiencing
Traveling

Doing
Making
Collecting
Drawing
Painting

Explaining
Showing
Discussing
Debating

Individualizing
Peer tutoring
Grouping
Tutoring
Contracting

Listening
Storytelling
Puppetry
Oral reading
Book or media talking
Webbing

Checklist of End Products

Work sheets
Research paper
Database

Oral reports
Showing
Dramatization

Creative writing
Written music
Newspaper

Enjoyment

Contests
Collections

Realia or models
Food to eat

Books
Picture books
Sound books
Pamphlets

Charts
Graphs
Maps
Pictures

Transparencies
Slides
Filmstrips
Films

Tape recordings

Videotapes

Games

Computer programs

Learning centers

Puppets/Puppet shows

Products of living things
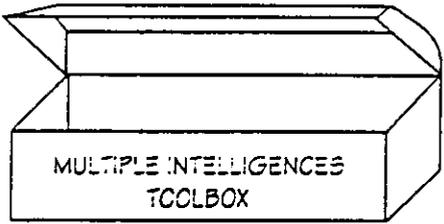
Community service project

Multiple Intelligences and the Research Process

Student learning style should influence the types of resources used and the final presentation of the synthesized information. Howard Gardner has identified "seven intelligences," which in combination affect an individual's thinking and learning style. David Lazear has assembled a "Multiple Intelligences Toolbox" of creative strategies. Any of these strategies might be used to engage learners in developing information literacy.

VERBAL/LINGUISTIC	LOGICAL/MATHEMATICAL	VISUAL/SPATIAL
• Reading	• Abstract Symbols/Formulas	• Guided Imagery
• Vocabulary	• Outlining	• Active Imagination
• Formal Speech	• Graphic Organizers	• Color Schemes
• Journal/Diary Keeping	• Number Sequences	• Patterns/Designs
• Creative Writing	• Calculation	• Painting
• Poetry	• Deciphering Codes	• Drawing
• Verbal Debate	• Forcing Relationships	• Mind-Mapping
• Impromptu Speaking	• Syllogisms	• Pretending
• Humor/Jokes	• Problem Solving	• Sculpture
• Storytelling	• Pattern Games	• Pictures

MUSICAL/RHYTHMIC

- Rhythmic Patterns
- Vocal Sounds/Tones
- Music Composition/Creation
- Percussion Vibrations
- Humming
- Environmental Sounds
- Instrumental Sounds
- Singing
- Tonal Patterns
- Music Performance

MULTIPLE INTELLIGENCES
TOOLBOX

INTRAPERSONAL	INTERPERSONAL	BODY/KINESTHETIC
• Silent Reflection Methods	• Giving Feedback	• Folk/Creative Dance
• Metacognition Techniques	• Intuiting Other's Feelings	• Role Playing
• Thinking Strategies	• Cooperative Learning Strategies	• Physical Gestures
• Emotional Processing	• Person-to-Person Communication	• Drama
• "Know Thyself" Procedures	• Empathy Practices	• Martial Arts
• Mindfulness Practices	• Division of Labor	• Body Language
• Focusing/Concentrating Skills	• Collaboration Skills	• Physical Exercise
• Higher-Order Reasoning	• Receiving Feedback	• Mime
• Complex Guided Imagery	• Sensing Other's Motives	• Inventing
• "Centering" Practices	• Group Projects	• Sports Games

From *Seven Ways of Knowing: Teaching for Multiple Intelligences* by David Lazear © 1991 by IRI/Skylight Publishing, Inc. Palatine, IL. Reprinted with permission.

Cooperative Planning Sheet

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Teacher/Grade level: _____   Class size: _____

Content area: _____   Unit of study: _____

Estimated time: _____   When: _____

Skills or process to be developed:

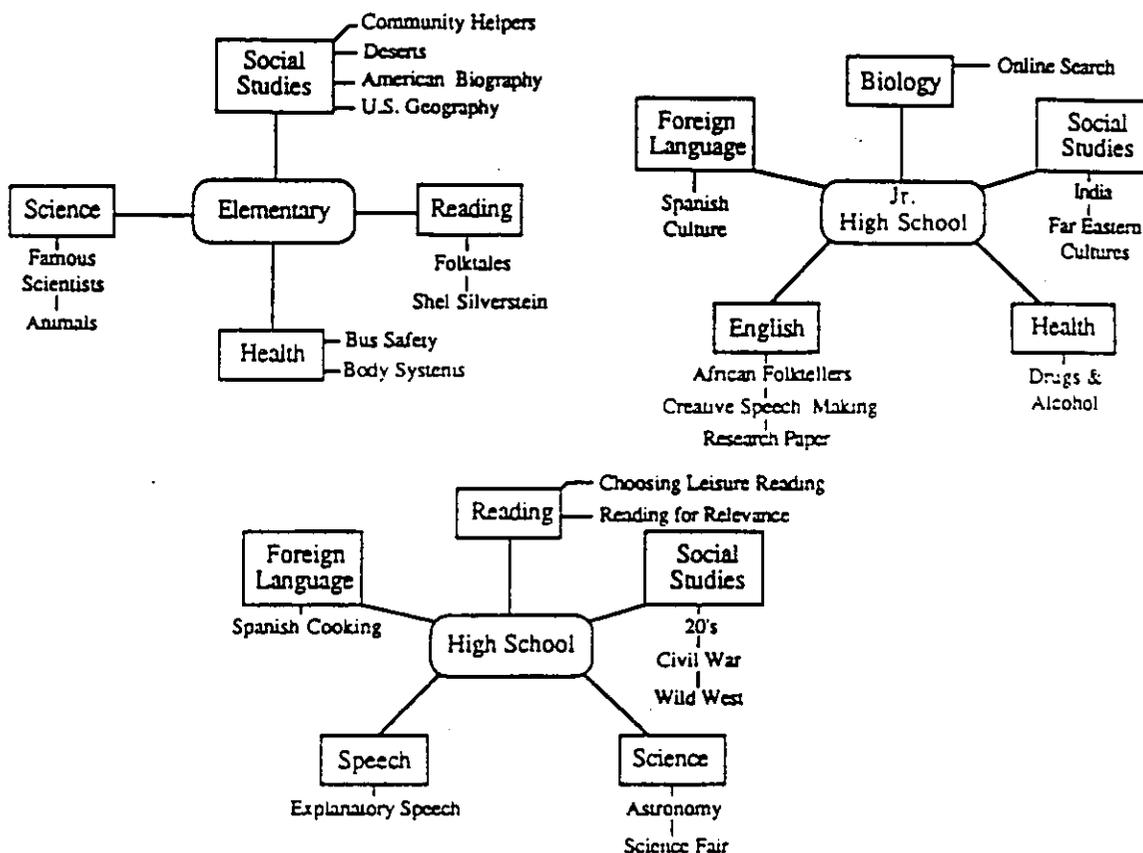| Classroom teacher's responsibility:	Media specialist's responsibility:

Abilities, interests, and special needs of students	Media, research and/or study skills	Evaluation of student learning

Curriculum Involvement of the Library Media Center

Curricular area:_____Unit title:_____Grade level:_____

Teaching techniques used:	How well did the LMC collection respond to unit objectives?	How well did students respond to the LMC activities and materials?
	Scale: 5 = excellent 4 = above average 3 = average 2 = below average	
MEDIA ACTIVITIES	1 = poor	
Research and study skills taught (if needed):	_____ diversity of formats (books, audiovisuals)	
	_____ recency (book, audiovisuals up-to-date?)	
	_____ relevance of collection to unit needs.	**Compliments and notes for improvement:**
Other activities (brief description)	_____ duplication (enough materials for number of students taught?)	
	_____ reading/viewing/listening level ok for all students?	
How well did the activities contribute to the unit?	**What do we need that we don't have? (books, audiovisuals, periodicals, etc.)**	
	How well did the LMC staff, facilities, and equipment function?	_____ taxonomy level(s) of LMC staff.
		_____ taxonomy level(s) of teachers.
		_____ taxonomy level(s) of students. (See DVL's taxonomies for rating.)

AMERICAN INDIANS

Figure 3

Lang. Arts	Soc. Studies	Science/Health	Fine Arts	Math
Explore myths, legends by regions. Spelling words from all content areas. Write a legend. Fiction/ nonfiction (characteristics). Sign language. Alphabetical arrangement.	Tribes grouped by region. Map skills. Compare cultures. Explore influence of geographic location and natural resources on culture. Stereotypes.	Mythology - astronomy connections. Impact of seasons, climate on way of life. Rocks. Plants. Natural medicines.	Masks. Pottery-making demonstration. Model dwellings. Chants, songs. Ceremonies. Games.	Money - systems of barter. Tools of measurement. Construct graphs. Predicting, estimating. Patterns. Calendars. Venn diagrams.
Storytelling: Pow-wow legends. Fiction/nonfiction. Booktalks. Location/arrangement. Catalog.	Locating information. Table of contents, index. Introduction to simple atlases. Book publication information.	LIBRARY CONNECTIONS

BIBLIOGRAPHY OF RELATED RESOURCES | Research for information about art projects using non-fiction books and encyclopedias. Display art work. | |

Library-Based Teaching Units 1987-88

Elementary (center)
- Social Studies
  - Community Helpers
  - Deserts
  - American Biography
  - U.S. Geography
- Science
  - Famous Scientists
  - Animals
- Reading
  - Folktales
  - Shel Silverstein
- Health
  - Bus Safety
  - Body Systems

Jr. High School (center)
- Biology — Online Search
- Foreign Language
  - Spanish Culture
- Social Studies
  - India
  - Far Eastern Cultures
- English
  - African Folktellers
  - Creative Speech Making
  - Research Paper
- Health
  - Drugs & Alcohol

High School (center)
- Reading
  - Choosing Leisure Reading
  - Reading for Relevance
- Foreign Language
  - Spanish Cooking
- Social Studies
  - 20's
  - Civil War
  - Wild West
- Speech
  - Explanatory Speech
- Science
  - Astronomy
  - Science Fair

Overlay of Units To Be Planned During the Next School Year:

Elementary:

Social Studies: Immigration, Elections
Science: Energy, Magnets
Health: Home Safety, Drugs, Smoking
Reading: Nonsense Rhymes

Junior High:

Social Studies: Pennsylvania History
Foreign Language: Spanish Holidays
Speech: Techniques of Debating
Science: Space, AIDS
Reading: Making a Database of Favorite Fiction

High School:

Biology: Formulating a Biology Database
Foreign Language: Spanish Cooking, Other Cultures'
 Lifestyles
English: Folklore
Health: AIDS
Social Studies: Vietnam, Terrorism

Audience: The local school board and administration

Time: Annual library media center presentation

Objective: To present a picture of the school library media program's integration with the school district's classroom curriculum in 1987-88 along with the additional

HISTORY

What should be taught?
1. A multicultural view.
2. The significance of the past.
3. "Real" history - how things really were.
4. Change and the consequence of change.
5. Living and coping with uncertainty.
6. The complexity of historical causation.
7. Individuals do make a difference.
8. The nontraditional, the irrational, and accidents make a difference.
9. Relationships between geography and history.

How should history be taught? Help young people:
1. Distinguish between the important and the inconsequential.
2. Avoid pat judgments about the past.
3. Recognize the difference between fact and conjecture.
4. Recognize the difference between evidence and assertion.
5. Create significant questions.
6. Get the facts straight.
7. Relate new information to what is already known.
8. Ask higher order questions.
9. Stimulate student's attention and motivate them.
10. Organize data for decision making.
11. Create images and meaning in the world.
12. Create hierarchical systems of interrelationships.
13. Share enthusiasm.
14. Develop a system of inquiry.

What activities should be fostered?
1. Better textbook/lecture approaches.
2. Debates.
3. Extended textbook/lecture/discussion.
4. Reflective inquiry (macroprocessing)
5. Games.
6. Quizzes.
7. Generate data, construct records, develop linkages.
8. Solve well-defined and well-written problems.

Sources:
1. *Historical Literacy: The Case for History in American Education.* Edited by Paul Gagnon and The Bradley Commission on History in Schools. Houghton Mifflin, 1989.
2. *Charting a Course: Social Studies for the 21st Century: A Report of the Curriculum Task Force of the National Commission on Social Studies in the Schools,* November, 1989.

SCIENCE

What should be taught?

1. More understanding, less distortion.
2. The ability to discard long-held beliefs as new evidence appears.

How should science be taught?

1. Begin with the concrete, move to the abstract.
2. Learn to apply ideas in novel situations.
3. Provide feedback.
4. Teach scientific inquiry.
    a. Start with questions.
    b. Engage students actively.
    c. Collect and use evidence.
    d. Provide an historical perspective.
    e. Insist on clear expression.
    f. Use a team approach.
    g. Don't separate knowing from finding out.
    h. De-emphasize memorization of technical vocabulary.

5. Build scientific values:
    a. Welcome curiosity.
    b. Reward creativity.
    c. Encourage questioning.
    d. Avoid dogmatism.
    e. Promote aesthetic response.

6. Counteract anxiety:
    a. Build on success.
    b. Include lots of experience using tools.
    c. Support girls and minorities.
    d. Emphasize group learning.

What activities should be fostered?

Collecting, sorting, cataloging, observing, note taking, sketching, interviewing, polling, surveying, using instruments, measuring, counting, graphing, computing, exploring the properties of, planting, and cultivating.

Source: *Science for All Americans: A Poject 2061 Report on Literaqcy Goals in Science, Mathematics, and Technology.* American Association for the Advancement of Science, 1989. (available from: AAAS, 1333 H Street NW, Washington, D.C., 20005)

Voyage Pre-Requisite:

In order to prepare you for your upcoming voyage the following investigations are required; by authority of the crown.

1. Create a map of North America. (Remember there were no bounderies separating countries or territory.) Using a key of symbols or colors, plot the land claimed by the following countries between 1400 and 1700: France, Spain, Holland, England, and Native Americans.

2. Plan your voyage to America. Include:
a. Supplies for the voyage
b. Names and relationship of family member (if any) travelling with you
c. Plot your expected route of travel between England and Roanoke
d. Make a list of concerns regarding the voyage and new colony.

Royal Documents: Issued by the authority of King James of England

-Guard said documents with the honor of England-
-Follow the King's wishes-

THE MYSTERY OF ROANOKE

In July of 1587, an English explorer by the name of Sir Walter Raleigh, selected Roanoke Island off the coast of (what we now call) Virginia as the location for the first English settlement in the *New World*. (Because North America was previously unexplored land and unknown territory, the Europeans commonly called the continent the *New World*.)

Raleigh sponsored the trip. Led by John White (an artist) a group of 114 settlers set sail for the New World. They established the first English colony.

John White was the governor of Roanoke. White's daughter, Elenor White Dare, gave birth to the first English child born in America. The child was a girl, and she was named Virginia Dare.

White hoped to live peacefully with the Native Americans. The Native Americans were often attacked by earlier explorers. A few months after the colonists arrived one of the Roanoke settlers was killed by a Native American. A group of soldiers who arrived with the Roanoke party in turn killed some nearby Native Americans. The Roanoke colony and the Native Americans could no longer wish for a peaceful relationship.

Additional preparation requirements are met by completing two of the following investigations:

1. What do you think happened at Roanoke? Try your hand as a mystery writer. Using factual information write a fiction or non-fiction story regarding the Roanoke mystery.

2. Create a list of your activities once you set foot on land. What is it that you then need to do?

3. John White was an artist. He drew many pictures and paintings of the colony. Try creating what you think John White drew.

4. Investigate some of the following names:
Roanoke
The Lost Colony
Virginia Dare
John White
Sir Walter Raleigh
Croatoan

-See page . Roanoke for resources-

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p.

The ship that delivered the settlers to America needed to return to England. The soldiers needed to return to their home land and the Roanoke settlers needed supplies. Against his will, John White returned to England. The settlers believed John White would have the best luck in raising the money that they needed to purchase supplies.

It took White many weeks to cross the Atlantic Ocean to return to England. White obtained supplies and tried to return to Roanoke in the early months of 1588. A storm forced his ship to turn around. A war broke out between Spain and England. They were fighting over control of the north atlantic ocean and North America. The English finally won. The war delayed White's return for two more years! White finally made it back to Roanoke in 1590; almost three years after he left.

The settlement was empty. The only clue John White could locate was a carving on a tree. The carving read: CROATOAN. White and his shipmates spent a month searching for the settlers. They found nothing. Sadly, White and the crew returned to England.

England would not soon attempt another colony in North America. It has been now almost 17 years. The mystery of Roanoke still haunts us... but we must now move on.

Many scholars and advisors to the crown have thoughts about what happened at Roanoke; but nobody really knows for sure. Often, we in the court, refer to Roanoke as the Lost Colony.

You must now embark upon the King's wishes. Follow his guide along the sides of this document. And...Long live the King!

Directions for Jamestown:

While visiting Jamestown we are going to take on roles that different colonists filled. Some colonists were Scientists, Mathematicians, Architects, Children, and Captains. Some inhabitants, such as the Native Americans, were occupying the territory before Jamestown was even built. Each colonist saw life from their point of view and perspective. You are going to look at Jamestown through their eyes.

You are to choose one survival investigation for the Jamestown section. If you choose to investigate additional survival activities in Jamestown they will provide you with more chances of success. Maintenance inquiries are at the end of the Jamestown section. None of these maintenance activities are required. Completion of these activities will also be added to your chances for survival.

Jamestown, Virginia

When the pilgrims arrived at Jamestown they were greeted by the presence of a thick forest. The forest was described as being dark, thick, and tall. The colonists needed to clear this forest in order to build their settlement. One colonist wrote that the clearing created by the settlers hardly made a dent in the vast forest that they encountered.

Unfortunately, that was the least of Jamestown's problems. Jamestown had many problems. In the first couple of years most of the settlers died of starvation. (Remember: all of their supplies were coming from the Virginia Company in England across the ocean. These settlers had to build housing and begin planting crops in order to survive. It takes a long time for crops to grow. The colonists had to rely on hunting and food from wild plants to live. Their supplies from England were very low, and a lot was old or rotten.)

The Virginia Company's ships continued to sail between England and Jamestown. New settlers were always being brought to the colony. But, it did not look like the colony was going to survive. There were many reasons for this:

1. Remember that the colony is owned and supported by the Virginia Company? This meant that everybody in the colony received the same amount of supplies as everybody else. It did not matter how much or how little they worked. They still ate, and they still shared in all the benefits of the community. This did not give many settlers a reason to work hard.

2. Many of the first settlers were from an "upper class" of people in England. They were very important people and also very wealthy people. They considered themselves too good to work.

Survival:
Required: 1 inquiry in Jamestown Section

Scientist

1. Research the forests in the Virginia area where Jamestown was settled. What types of flora and fauna created these forests? (*flora*: plants, trees, flowers; *fauna*: wildlife.) How could the forest be a resource and a detrimate to the settlers? How fast could a one acre forest be cleared today? How fast could the colonists clear one acre?

2. Think about clearing the forest area. What tools would be necessary to clear a forest? What tools were available to the colonists? How did they get these tools? What do these tools look like? Do we have tools that our similar to the tools the colonists used? Compare these tools to our simple machines of today (pulleys, levers, gears, wedges, wheels & axels, inclined planes, etc.) Where do you see today's use of simple machines? Try inventing your own tools using simple machines as a foundation.

Survival:

-Weather-

9. How do weather vanes work? What information could a weather vane provide a colonist? could the colonists predict weather as we do today? What methods did they use?

-Communication-

10.
a. How did the colonists get their news and information? Were there newspapers in the colonies? Who printed them? Were they legal? Whose point of view were they from? Research the history of the newspaper. Also look-up the history of the printing press.

b. Were there books available to the colonists? How were they made? What kinds of books were available? did they have libraries?

c. did the colonists receive mail? What was their mailing address? How could mail be delivered? Who delivered the mail? Did they sell postage stamps? How did you pay for a letter? Were there envelopes? How long would a letter take to be delivered? Look up the history of the postal system and mail delivery. See also: milestones.

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approximately $1.23 a pair in today's money. Yet, in 1775 a pair of shoes cost around $1.64 in today's money. Why would cheese prices drop and shoe prices rise? It is also wondered if prices were the same between colonies.

Although prices may have differed, there were two things to be sure of: every successful, growing village would have a mill, and a tavern. For most colonies, the mill was a necessity to all colonial life. Virginia is reported to have the first wind mill in 1621. The first water mill existed in Maine in 1620. However, the central meeting place for most villagers and travellers was the tavern or the inn. These establishments held many important meetings, both secret and private. Much information was passed at these establishments.

How did the colonists get their information? Were there books and newspapers, and mail? We know that if you lived in the colonies and ordered a dress from England you would be lucky to receive it in one year. Messages between colonies and homeland England must have been desperately slow. One can only imagine how the colonies might have developed if they had access to today's communication and transportation.

Weather ruled the colonist's day. Colonial America had a variety of weather vanes. Weather vanes could be found on most buildings in the colonies. the earliest weather vanes were cloth flags. The word "vane" comes from the word "fano" meaning flag. The first two tornadoes ever recorded were both in New Haven, Connecticut in the years 1682 and 1839.

The colonists were very strict in their codes of conduct. Many colonists spent most of their Sunday in church. Everybody was expected to attend. The only time somebody was excused from church was in the case of extreme illness. Preachers would talk for almost five hours. Many parishioners brought their lunch. Because there was no electricity, and the

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Maintenance:

-Weather-

23. What kind of weather vanes exist today?

24. How different was the climate on the Eastern coast of North America compared to the climate of England? Consider seasons, temperature, humidity, rainfall, et cetera.

-Taverns-

25. What was colonial tavern like? If you worked in a tavern, what could your job be? When you entered a tavern what would you expect to find? Were there any events that regularly occured in taverns?

Survival

-Medicine-

5. Where do you think the word "apothecary" came from? What kinds of herbs and medicines would be found in an Apothecary's Shop? What would they cure? How well would they work? What does an Apothecary Shop look like? Are there herbs used for medicinal purposes today? Do we have a shop that is similar to the Apothecary Shop of olden days?

Did the Native Americans play a role in educating the colonists about herbs and health care?

-Shopkeepers & Storefronts-

6. Pick an occupation you would like to hold in colonial days. Design your own sign or logo. What would your sign look like? Create a sign that identifies you. Hang it over your desk or on your bedroom door.

Why do you think the shopkeepers used this method for identifying their business?

Can you find examples of companies that use this identification method today? Look at businesses, restaurants, sports teams, and logos.

For additional resources regarding Medicine see page .

Colonial Living

Housing, crops, and religion differed among the colonies. Yet, many experiences were shared by most colonists. Everyday life in colonial America was much different from today. The villages looked differently, the buildings looked differently, and the community members behaved differently and required different services than we do today.

Many occupations existed in colonial days that are different from today. Do you know that a maker of shoes was called a *cordwainer*; but a repairer of shoes was called a *cobbler*? Occassionally colonists would be visited by a traveller who both made and repaired shoes. He was called a *catwhipper*.

If you lived in colonial days you could be an itinerant, or a tinker, or a chandler...you may even provide a number of services. Many colonists had to be skilled in many occupations. One such person was the colonial barber. The barber was one person that was also allowed to perform certain functions of a doctor, such as blood-letting and leeches. Doctors were very scarce in colonial days.

Disease was the cause of much death; and not just the colonists. Many of the Powhaten Indians died from diseases that they caught from Europeans. These diseases included: small pox, measles, mumps, bubonic plague, diptheria, scarlet fever, cholera, typhus, whooping cough, and yellow fever. In fact, more Indians died from diseases than were killed outright. There were approximately 3,000 Massachuset Indians in 1600. In 1631 after a small pox epidemic there were only approximately 500 Massachuset Indians remaining.

Maintenance:

-Medicine-

13. Research words associated with the history of medicine such as disease, illness, medicine, doctors, apothecary, elixirs, leeches, blood-letting, and snake oils.

14. Research the history of medicine and "cures". How is the way that we treat illnesses different from the way the colonists treated sickness and injury?

15. Research how we treat and control diseases today. Do we still have the same diseases today that we had years ago? Do we have new diseases? What would cause new diseases? Can they be prevented or cured?

16. What are vaccinations? What are immunizations? Where do the two words stem from?

17. Research the medicine man. Determine how the medicine man gained his powers and honor. Find examples of ways that medicine men would care for their tribe.

An Information Literacy Model

The searcher's thinking, the stages of the research process, and instructional strategies can be brought together in an information literacy model. As presented below, the model is shown in a two-dimensional space, but in actuality, the components are not linear. However, the linear presentation is used to emphasize how a searcher's thinking can trigger a research process stage, which in turn triggers an instructional strategy. For example, "Why do I need information?" may trigger the research process stage of "Exploring the need for information" which may trigger the instructional strategy of "Start a journal to track the research process."

Searcher's Thinking	Research Process Stages	Instructional Strategies
1. Why do I need information?	1. Explore/identify the need for information	1. Start journal to track the research process Brainstorm/cluster discuss/map Quickwrite
2. What is the problem, topic, or question?	2. Formulate the central search question	2. Create possible questions Continue journal at each step
3. What do I already know about this problem/topic/question? What must I find out?	3. Relate the question to previous knowledge Identify key words, concepts, and names	3. Quickwrite Brainstorm/cluster, map Use general information sources for background
4. Where can I find the information I need? Is the information in my classroom or library media center? Are there people I can ask? Should I go to libraries, museums,...?	4. Identify potential resources	4. Brainstorm possible resources Cluster resources by type, location, etc. Create checklist of resources How appropriate is each? How accessible is each?
5. How do I get started? What are some key words/topics/ideas? Where do I go first?	5. Develop general strategies to organize the search	5. Develop key word and Boolean search strategies

From: CMLEA

6. What resources can I find? Which can I use?

6. Locate and explore previously identified resources

6. Interview people
   Go to libraries, museums, information centers
   Collect resources
   Observe/experience/read

7. How shall I use/search these resources? How will I find the information I need? What strategies should I use?

7. Select the most useful resources for further exploration and formulate specific strategies for using them

7. Develop search strategies
   Use information retrieval/location/research skills

8. What information will help me?

8. Search for relevant information in these resources

8. Read, view

9. What should I record? What is important? How could I record it? How could I arrange it?

9. Evaluate, select, and organize information

9. Cluster ideas into subtopics
   Use outlining and note-taking skills

10. Have I found the information I need? Should I look further?

10. Analyze information retrieved; determine its relevance; interpret, infer, and synthesize

10. Review information to see if it meets original needs

11. How will I use/present the information? Who is my audience? In what form could I use/present it? How could I structure it?

11. Determine how to use/present/communicate information
    Organize information for intended use

11. Consider options for presenting information
    Make needed decisions
    Solve original problem
    Develop written, visual, oral, multimedia, or other presentation

12. How have I done?
    ... in my opinion?
    ... according to others?
    What knowledge have I gained?
    What skills have I learned?
    What could I improve and how?

12. Use information
    Evaluate results
    Evaluate process

12. Review the product
    Review the research process journal
    Review with teacher, family, and peers
    Plan changes for next project

The Information Literacy Model that appears on pages 6-9 has been adapted and expanded from *Research as a Process: Developing Skills for Life in an Information Society* (Los Angeles County Office of Education, 1989).

Information Literacy

From: CMLEA

Colorado Department of Education
State Library and Adult Education Office

Colorado Educational Media Association

MODEL INFORMATION LITERACY STANDARDS

DRAFT
January, 1994

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ALL STUDENTS WILL USE INFORMATION
AND IDEAS EFFECTIVELY
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Philosophy

Information-literate students are competent, independent learners. They know their information needs and actively engage in the world of ideas. They display confidence in their ability of solve problems and know what is relevant information. They manage technology tools to access information and to communicate. They operate comfortably in situations where there are multiple answers, as well as those with no answers. They hold high standards for their work and create quality products. Information literate students are flexible, can adapt to change and are able to function independently and in groups.

Information literacy standards provide all students with a process for learning that is transferrable among content areas and from the academic environment to real life. These standards are that the student:

- Constructs meaning from information.
- Creates a quality product.
- Learns independently.
- Participates effectively as a group member.
- Uses information and information technologies responsibly and ethically.

The responsibility for helping students achieve information literacy resides with library media staff, teachers, administrators and the community.

The library media specialist, teaching collaboratively with other teachers, is vital to student learning. The library media specialist:

- Holds an overall view of the school curriculum.
- Uses resources, including technology, and expertise to integrate information literacy standards.
- Promotes interdisciplinary learning.
- Connects the student and school to larger communities.

Rationale

Information literacy is a process applicable to all content areas.
By collaborating with the classroom teacher, the library media specialist enables students to achieve content standards. The efficient use of these skills is necessary for successful living in the twenty-first century.

Why these five standards?

Standard 1 - Knowledge seeking is a process. It is applicable to information in any form. This standard gives students the freedom to learn and be self-sufficient. Standard 1 builds on traditional information skills curriculum and extends beyond location skills.

Standard 2 - Standard 2 is a natural continuation of the process in Standard 1. In order to raise the level of expectation for quality of student work, Standard 2 is required. Quality products are necessary in all content areas. The information and resources to create a quality product are available through the library media program. Library media specialists work with the classroom teacher to help students create quality products.

Standard 3 - Self-directed learning skills are critical in developing lifelong learners. Independent learners can filter vast amounts of information to meet their needs. Recent research indicates that voluntary reading is the single most important factor in developing reading skills. Becoming independent creates self confidence and self esteem. In the library media center students can exercise independent learning skills.

Standard 4 - The library media center is where individual differences mesh with diversity of resources and technology. When in a group, students learn how to defend opinions as well as constructively criticize opinions. Products created by a group are different from those created by an individual, reflecting the synergy of the group.

Standard 5 - Responsible citizens make ethical information decisions. Standard 5 expandsthe traditional ethical responsibilities toward print materials to include nonprint and electronic resources. Equal access to materials is a right of all students.

The interrelationship of Standards 1 through 5 is essential to an exemplary library media program. Standards can be applied individually or together in any educational setting and content area, in any order. Neither the standards nor the indicators are linear.

Standard 1
Students as Knowledge Seekers

The student constructs meaning from information.

The student:
- Determines information needs
    - States the purpose
    - Explores options
    - Defines a manageable focus

- Develops information-seeking strategies and locates information
    - Frames appropriate questions
    - Identifies likely resources
    - Uses a variety of strategies
    - Builds a reasonable timeline
    - Makes ethical decisions (See Standard 5)
    - Records bibliographic information

- Acquires information
    - Questions others
    - Listens actively
    - Queries electronic resources
    - Reads for significant details and concepts
    - Views for significant details and concepts
    - Extracts appropriate details and concepts

- Analyzes information relative to need
    - Identifies criteria in terms of:
        authoritativeness, completeness, format, relevance
        point of view, reliability.timeliness
    - Applies criteria to information
    - Retains only appropriate material

- Organizes information
    - Creates outlines, storyboards or graphic organizers
    - Assembles material to meet information need
    - Credits appropriate sources

- Processes information
    - Integrates information from a variety of sources
    - Makes inferences
    - Draws conclusions
    - Constructs meaning
    - Builds connections to prior knowledge

- Acts on information
    - Answers a question
    - Satisfies a curiosity
    - Takes informed action
    - Develops a product
    - Solves a problem
    - Presents information

- Evaluates process and product
    - Determines level of product success (See Standard 2)
    - Identifies process strengths and weaknesses
    - Develops a plan to continuously improve the process

Standard 2
Students as Quality Producers of Information

The student creates a quality product.

The student:
- Recognizes quality and craftsmanship
  - Uses existing models and criteria as a guide
  - Critically evaluates those models
  - Develops personal criteria for a quality product

- Plans the quality product
  - Establishes a clear purpose
  - Considers the audience
  - Determines product content
  - Chooses format
  - Develops process
  - Identifies necessary resources

- Creates a quality product
  - Uses resources and technology (See Standard 1)
  - Reflects knowledge of learning styles
  - Integrates appropriate media (See Standard 5)

- Presents a quality product
  - Communicates clearly
  - Reflects established criteria
  - Demonstrates effective presentation skills

- Evaluates quality product
  - Evaluates the process and the product continuously
  - Measures product against models and criteria
  - Revises and refines as necessary
  - Determines if product has achieved its purpose
  - Decides if produce has reached its desired audience
  - Reflects on personal satisfaction with the product (See Standard 3)

Standard 3
Students as Self-directed Learners

The student learns independently.

The student:
- Voluntarily establishes clear information goals and manages progress toward achieving them (See Standards 1 and 2)
  - Realizes that not all problems have a solution
  - Makes choice to pursue or modify the search

- Voluntarily consults media sources
  - Reads for pleasure, to learn and to solve problems
  - Uses media sources for information and personal needs
  - Seeks answers to questions
  - Considers alternative perspectives
  - Evaluates differing points of view

- Explores topics of interest
  - Uses the library media center, public library and other information sources (e.g. electronic information, bookstores, directories, experts)
  - Asks for help
  - Recognizes organization and structure of information centers

- Identifies and applies personal performance standards
  - Engages in reflective analysis
  - Internalizes the model and process of inquiry (See Standards 1 and 2)
  - Balances internal and external performance demands
  - Reflects on personal satisfaction

Standard 5
Students as Responsible Information Users

The student uses information responsibly.

The student:
- Practices ethical usage of information and information technologies
  - Applies copyright guidelines
  - Cites references in proper format
  - Avoids plagarism
  - Recognizes copyright as protection for the copyright holder

- Respects the principle of intellectual freedom
  - Understands concept of intellectual freedom
  - Recognizes importance of intellectual freedom

- Follows guidelines and etiquette using electronic information sources
  - Utilizes electronic resources to locate, retrieve, and transfer information
  - Applies time and access constraints when using electronic resources

- Maintains the physical integrity of information resources and facilities
  - Follows policies and procedures
  - Preserves integrity of print and nonprint materials
  - Acknowledges and respects the rights of others

- Recognizes the need for equal access to materials and resources

Standard 4
Students as Group Contributors

The student participates effectively as a group member.

The student:
- Helps group determine information needs (See Standard 1)
  - Works with group to define project or problem parameters
  - Collaborates to determine:
    common definitions
    questions
    processes
    information access skills

- Shares responsibility for planning and producing a quality group product
  (See Standard 2)
  - Collaborates to define roles and divide responsibility
  - Completes tasks in a timely manner
  - Helps synthesize individual tasks into finished product

- Collaborates to determine relevant information
  - Selects information using various resources and technologies
  - Works with others to organize information
  - Helps integrate information from a variety of sources

- Acknowledges diverse ideas and incorporates them when appropriate
  - Shows respect for others' ideas, backgrounds and learning styles
  - Discusses opposing viewpoints constructively
  - Helps create projects that reflect differences among individuals

- Offers useful information to the group, defends that information when appropriate, and
  seeks consensus to achieve a stronger product
  - Offers well thought-out evidence justifying information presented
  - Moderates ideas of group toward consensus, while allowing
    individuals to maintain their own opinions
  - Demonstrates effective interpersonal communication skills

- Clearly communicates ideas in presenting the group product
  - Assimilates ideas of others into group presentation
  - Helps ensure that all participants' contributions are represented
  - Uses a variety of media effectively to communicate ideas

- Evaluates the product, the group process, and individual roles continuously
  - Works with the group to set criteria for the product
  - Uses the criteria to determine the success of the product

Don't Believe Everything You Read

Ideas For Reading Critically About Science

No matter how information is presented, whether it's as a research article or as one in a popular newstand magazine, it is important to read that information critically in order to evaluate it. The following ideas are *suggestions* to think about while reading. This is not an all-inclusive list nor will every idea be applicable to every article you read. But if you keep these ideas in mind as you read, they should be able to help you analyze and assess the information being presented.

■ Nature of the Information and Documentation:

1. What is the nature of the information presented?
   - Original data?
   - Summaries of original data?
   - Anecdotal information?
   - Background information?
   - Interpretation of original data and explanation of significance?

2. What is the nature of the documentation?
   - Is supporting evidence given?
   - Are sources for that evidence clearly documented?
   - Are sources for that evidence appropriate
     - What are the credentials of the sources?
     - Are the sources current?

■ Purpose and Intended Audience:

3. What is (are) the purpose(s) of the article?
   - To describe (What happened)?
   - To explain (Why did it happen)?
   - To interpret (What does it mean)?
   - To entertain?

4. Who is the intended audience?
   - General reader?
   - Professionals in the same discipline?
   - Professionals in other disciplines?

■ Credentials:

6. What are the credentials of the author?
   - Is there an identified author(s)?
   - Did the author do the research?
   - Is the author someone who's working in the field?
   - What is the author's point of view?
   - Does the author have a bias?

Instructive session 8 (Loomis and Herrling) cont.: Appendix D

— ABIGAIL LOOMIS AND PATRICIA HERRLING —

7. What are the credentials of the journal/magazine?
    Is it peer-reviewed?
    What is the reputation of the journal?
    Is it published by a professional association and if so, what do you know about the
        reputation of this association?
    Is it published for profit [reword]?
    What role does the profit motive play in the selection of articles for this journal/magazine?

8. Is a funding source or site for the research described identified?
    Does that funding source imply a bias?

■ Presentation and Style:

9. How is the information presented?
    Is the research placed in a context (i.e., do you know why it was done?)?
    Is the methodology stated with enough detail to be replicated?
    Is the significance of the results clear?

10. What is the style of the article?
    Is it well-written?
    What is the nature of the language used?
        Easy to understand for general reader?
        Technical?
        Objective?
        Emotionally charged?
    What is the level of detail in the article?
    Are the language and level of detail used appropriate for the intended audience
        and the purpose?

11. What kinds of illustrations are included (e.g., graphs, photos, drawings, etc.)?
    Are the illustrations appropriate to the content and style of the article?
    What is the purpose of the illustrations?
    Do the illustrations have captions and are these clear and appropriate?
    Are there hidden messages to the illustrations?

5

The Creative Process

This chapter will discuss what researchers and writers have discovered about creative thinking. By understanding the creative process, you can nurture the ideas you generate. Knowing the process your mind goes through when developing ideas will help you learn to use new tools effectively and creatively. This will enable you to use computers to undertake complex projects. This chapter will show you ways to diagram work flow so you can clearly picture your process. There are typical syndromes you may be struggling with. Yet you can overcome them and discover how working with electronic media can make the creative process easier to carry out. The activities at the end of the chapter will help you apply the creative process to projects you can do using electronic media.

What Is Your Creative Process?
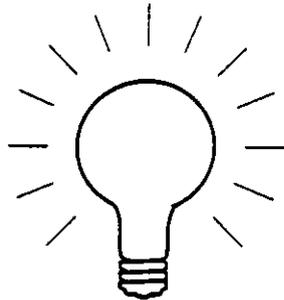
Ideation

Visualize where your ideas come from. Do you see any pattern in your own thinking when you are generating ideas? Maybe you have never thought about this before, or maybe it seems to you that creative thinking is simply chaotic. It may always seem to happen differently for you. Or you may have difficulty seeing how what you do relates to what other creative people do. There is a rich variation in how each of us approaches creative thinking. Yet there are patterns you can recognize. Understanding and building upon these patterns enables you to enhance your creative capacity. It also helps you to work creatively with other people.

Theories about the Creative Thought Process

creative process The stages your mind goes through when developing ideas. These stages include preparation (involving both first insight and saturation), incubation, illumination, and verification.

Many researchers have examined the *creative process* over the last 100 years. Creative individuals have also written about their own approaches. You can recognize similarities in how people describe this process. At the same time, examining the differences gives you divergent perspectives that may be helpful for recognizing this pattern in your own thinking. Examining some of these thinking patterns can help you develop a better understanding of the creative process. It will help you develop your

own approach to creativity which you can use in your discipline and computer environment.

In the latter part of the nineteenth century, Herman Helmholtz, a physiologist and physicist, described how he arrived at his own scientific discoveries. The process he described involved *saturation* — where he became immersed in research; *incubation* — which involved thinking over what he was researching; and *illumination* — where he received that flash of insight leading to his discoveries. You may recognize this pattern as similar to the creative process you experience.

Early in this century, the mathematician Henri Poincaré took this understanding of the creative process a step further. He pointed out that the creative process involves not only *saturation, incubation,* and *illumination,* but also *verification.* Verification is necessary to check or test ideas to make sure they are valid or meet the criteria of what you are searching for.

saturation
↓
incubation
↓
illumination

saturation
↓
incubation
↓
illumination
↓
verification

first insight
↓
saturation
↓
incubation
↓
Ah-Ha!
↓
verification
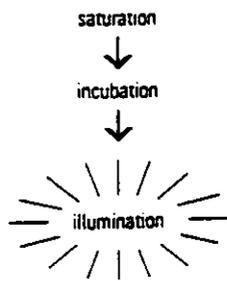
Helmholtz's Description of the Creative Process
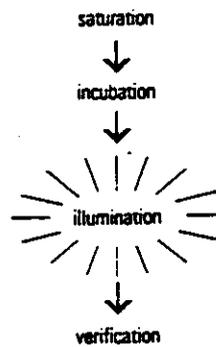
Poincare's Description of the Creative Process
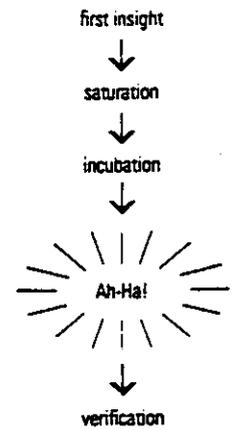
Getzel/Kneller's Description of the Creative Process

By the middle of this century, psychologists became interested in understanding creativity. Jacob Getzel recognized yet another stage in the creative process. He pointed out that creative individuals actually seek problems to solve and that this is a very necessary step for getting the creative process started. Another psychologist, George Kneller, termed Getzel's preliminary stage, involving finding or formulating problems, as the *first insight*. He observed that this applies to defining existing problems as well as to finding new ones. Getzel also described illumination as *the ah-ha.* This strange term vividly describes what we all experience when discovering a solution to a problem.

Using descriptions of the creative process that scientists, mathematicians, and psychologists experience, Betty Edwards — who is an artist, educator, and writer — integrated them in a very understandable way. In her

THE LMC AS DATA LABORATORY

LOCATION AND COMPARISON

Beginning Research

- We find facts from a single preselected source and report them.

- We compare facts from a single preselected source.

- We find facts from several preselected sources and report them.

- We compare facts from several preselected sources.

Advanced Research

- We learn information location attack skills for a variety of fact sources: reference books, nonfiction, databases, high tech sources, data collection instruments.

- We find facts from a variety of sources and report them.

- We compare facts from a variety of sources.

Original Research

- We collect original data (observation, survey, experimentation).

ANALYSIS AND EXTENSION

- We manipulate data from a variety of sources to draw conclusions, try new analyses, gain new insights.

- We combine published and collected data to draw conclusions, try new analyses, gain new insights.

- We question data: rejecting poor, incomplete, inaccurate, and inconsequential facts as they flow into our analysis.

- We pursue new or unique ways of representing data in graphical form.
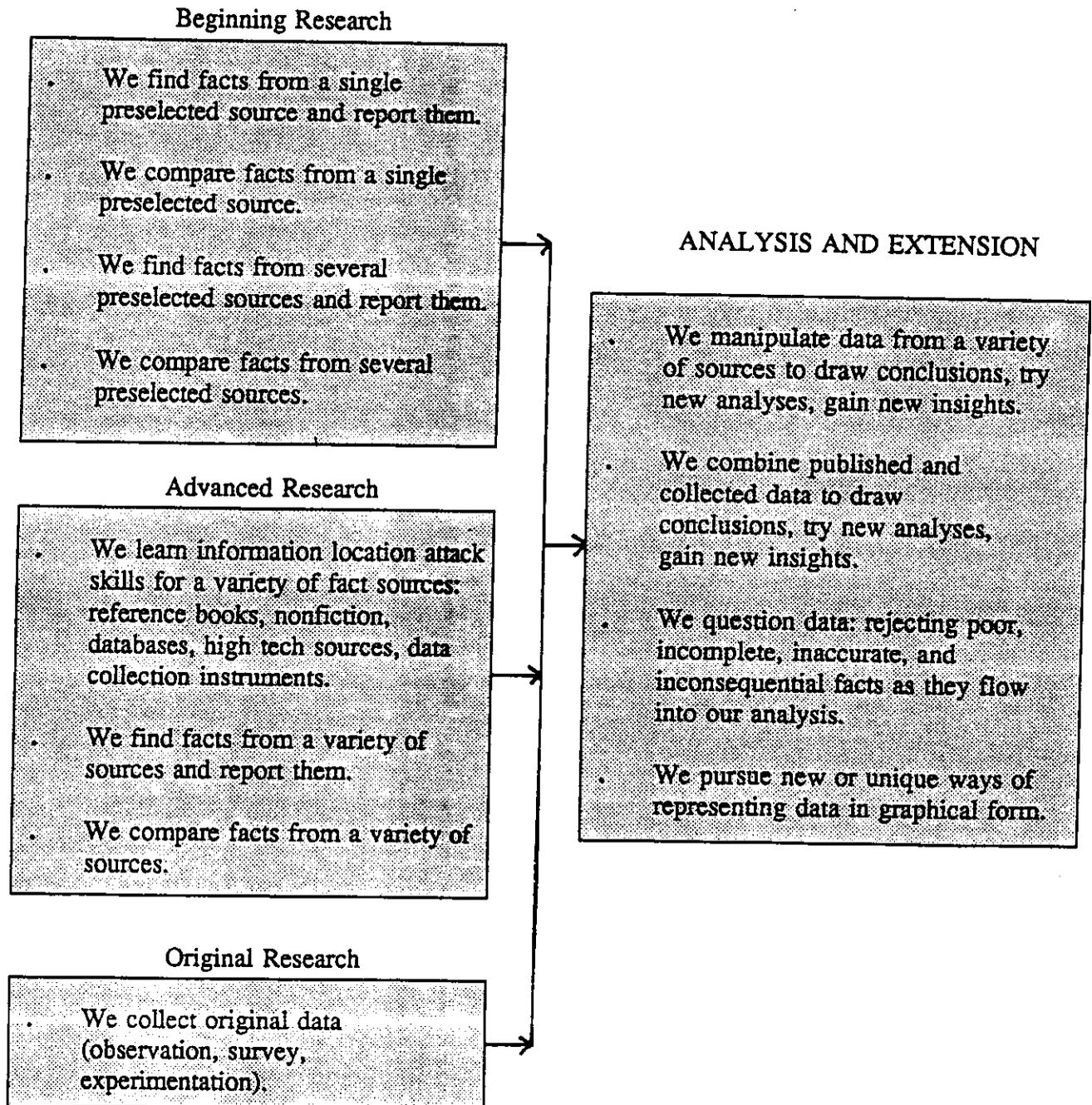
Use the following form to make a poem about a historical person. You may give more details or less than is called for. Also, the details may be one word or may be phrases. Try to be as accurate and complete in your description as possicle. Try several words before you decide which to use.

Line 1   First Name
    Line 2   Title
    Line 3   Four words that describe the person
    Line 4   Lover of (3 things or ideas)
    Line 5   Who believe (1 or more ideas)
    Line 6   Who wanted (3 things)
    Line 7   Who used (3 methods or things)
    Line 8   Who gave (3 things)
    Line 9   Who said (alquote)
    Line 10 Last Name

Line 1 _Isaac_

Line 2 _philosopher_

Line 3 _genius_ , _creative_

    brilliant , _analytic_

Line 4   Lover of _alchemy_ ,

    nature , and _philosophy_

Line 5   Who believed _in the 3 laws of motion_

Line 6   Who wanted _happiness_ , _new_

    discoveries , and _credit_

Line 7   Who used _chemistry_ , _recent_

    discoveries , and _tremendous concentration_

Line 8   Who gave _Principia_ , _3_

    laws of motion , and _opticiks_

Line 9   who said _If I have seen a little farther than others it is because I have stood on the shoulders of giants._

Line 10 _Newton_

Created by Ryan Sandlin

WHY STUDY MATHEMATICS!!!
"The Proof Is In The Pudding"
Topeka West High School: The Library
Honors Algebra   Professor Mariani

52

The following careers demand a strong and extensive background in mathematics:

Accountant	Auditor	Bank Officer
Buyer	Hotel Manager	Purchasing Agent
Underwriter	Architect	Surveyor
Aerospace Engineer	Chemical Engineer	Civil Engineer
Electrical Engineer	Mining Engineer	Mechanical Engineer
Metallurgical Engineer	Systems Analyst	Nuclear Engineer
Petroleum Engineer	Mathematician	Actuary
Computer Systems Analyst	Chemist	Statistician
Geophysicist	Meteorologist	Geologist
Agricultural Scientist	Biological Scientist	Physicist
Urban Planner	Secondary Teacher	Forester
Optometrist	Physician	Conservationist
Computer programmer	Cashier	College Professor
Insurance Agent	Real Estate Agent	Air Traffic Controller
Salesperson	Travel Agents	Real Estate Broker
		Tax Attorney

A career will be delegated to Honors Alebra teams. Each team will make an oral presentation near the end of the semester. The purpose will be to acquaint other Honors Algebra students with the plethora of information concerning careers that require a strong, extensive background in mathematics.

Each team will define and describe the career using the following criteria:

1. Nature of the work
2. Working conditions
3. Employment
4. Training
5. Qualifications
6. Advancement opportunities
7. Job outlook
8. Earnings
9. Importance of mathematics

Each team will conduct a video interview with someone active in the career field. The above criteria might serve as direction for the interview. Extra video footage of people on the job should be included for later editing. Remember to black blank tapes and to use the teleprompter.

With a computer-generated graph, chart, etc., visually compare and interpret the following information concerning institutions of higher learning that have vigorous major programs in the career field:

1. Select three out-of-state universities or colleges and one from Kansas that have dynamic programs in the career field. (see _Guide to Four-Year College Majors_) Compare and interpret the course offerings and requirements in the major field for this career.

2. Compare and interpret the following expenses for each university: tuition, cost of books, living expenses for each university: tuition, cost of books, living expenses (dorm, Greek, apartment).

3. Compare and interpret the following aspects of each university: campus location, library holdings, Hours, On-line, special programs, faculty, faculty student ratio.

Assume that you have obtained a Bachelor's degree in the major
field and are now ready to enter the profession. Select two cities listed below in which you might like to live.

London, England   Oklahoma City, Oklahoma
Toronto, Canada   Dallas, Texas
Seattle, Washington   Houston, Texas
San Francisco, California   Des Moines, Iowa
Los Angeles, California   Chicago, Illinois
Phoenix, Arizona   Springfield, Missouri
Denver, Colorado   Louisville, Kentucky
Colorado Springs, Colorado   Cleveland, Ohio
Alburquerque, New Mexico   New York City, New York
Minneapolis, Minnesota   Washington, D.C.
Omaha, Nebraska   Atlanta, Georgia
Tulsa, Oklahoma   Miami, Florida
                                   Lawrence, Kansas

Using newspapers from the two cities and Topeka, visually parallel the following:

1.   The selected career-salary, benefits, other information
2.   1 bedroom furnished apartment
3.   1987 Ford Escort
4.   1 pair of 501 jeans or comparable piece of clothing
5.   1 pound hamburger or comparable item of food
6.   1 six pack or 2 liter of cola or comparable beverage
7.   1 movie ticket
8.   1 video tape rental
9.   Ticket to a major sports or entertainment event
10.   Nike basketball shoes

With a computer-generated visual, compare cost-of-living versus salary. What appears to be the best place to work and live? Why?
Would your team select another city? Why?

Using _AAA Tourbooks_, almanacs, or other handbooks, compare and interpet the following information concerning the two cities from
out of state and Topeka:

    Population
    Educational Opportunities
    Public Transportation
    Sightseeing
    Sports and Recreation
    Shopping
    Dining (Four-Star Restaurants?
    Nightlife
    Theaters
    Concerts
    Special Attractions

Stephen J. Bloom

DATA BUDDIES:
PRIMARY-GRADE MATHEMATICIANS EXPLORE DATA

Students create sets of questions

magine that you must meet a person you do not know in a crowded public place, such as an airport or a shopping center. Additionally imagine that you wish to have a pleasant social encounter with this person, chatting over lunch and spending an afternoon touring some of the local sites. What information would you deem to be most important to know about this person? What additional facts would be helpful? How would you gather data about this person?

Imagine children's excitement as they are involved in a similar situation: they become partners with a student they do not know from another school and must identify their partner when they meet.

This article describes a project involving gathering and interpreting data by first- and second-grade children and teachers during each of the past three years. The project's purpose was to have children decide on and gather the data needed to identify someone they had never seen before. Children created, modified, and refined the questions they asked their partners as they saw a need for additional data. This exciting project allowed children and teachers a point of entry into the kind of meaningful mathematics explorations envisioned in the *Curriculum and Evaluation Standards for School Mathematics* (NCTM 1989). It offered teachers opportunities to develop, implement, and analyze teaching and learning mathematics as described in the *Professional Standards for Teaching Mathematics* (NCTM 1991).

Exploring the Idea and Planning the Project

The project begins each year with a meeting of the teachers who have expressed interest in participating. Curricular goals, instructional strategies, and implementation issues are collaboratively discussed, and instructional plans are developed. Developing the curricular goals is greatly facilitated by the group's examination and discussion of the K–4 statistics and probability section in the *Curriculum and Evaluation Standards* (NCTM 1989), each teacher's local curriculum documents, and the curricular goals set by the previous year's participating teachers. A sample of the curricular goals developed in previous planning meetings is shown in **table 1.**

A discussion of the section on standards for teaching mathematics of the *Professional Standards for Teaching Mathematics* (NCTM 1991) allows participants to "begin the kind of professional conversation essential to the improvement of classroom teaching" (Ball 1991, 18). From this discussion, a set of guidelines for the instructional strategies to be employed throughout the project is developed. A sample of these guidelines is presented in **table 2.**

A final component of this planning meeting is establishing the logistical details of the project. These details include—

* establishing the teacher and class buddies;

* determining a means for participating teachers to communicate with each other;

* deciding how and when the surveys and life-sized replicas will be exchanged;

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Sample Curricular Goals: Data Buddies

All students will complete these activities:

1. Develop survey questions to gather information about their buddy
2. Investigate the potential usefulness and limitations of the survey questions developed
3. Collect, organize, and represent data in a variety of ways
4. Construct, read, and interpret displays of data
5. Formulate and solve problems that involve collecting and analyzing data

Instructional Strategies: Data Buddies

1. Allow children to reason and communicate. During discussions students need to explain their thinking and justify their ideas. Ask questions like "Why do you want to ask your buddy that question?"
2. Help students solve problems. Offer suggestions and facilitate, reward perseverance, and try to avoid giving students answers. Ask students, "How will the answer to that question help you identify your buddy?"
3. Decide by consensus. Logic and evidence should guide decision making, not popularity. Ask students questions like "What other information about your buddy do you *need* to know? What other information about your buddy would you *like* to know?"
4. Use whole-class, small-group, partner, and individual grouping schemes. Let the purpose of a particular activity guide your grouping decisions.
5. Assess students' understanding in an ongoing fashion using a variety of means. Ask students questions as they work individually or in pairs. Especially note the questions raised by students.

"Why do you want to ask that question?"

- identifying the date and location of the Data Buddy Day;
- reaching consensus on the four questions that all teachers will use to begin the project; and
- developing a list of the materials needed for the project.

Pairing similar grade levels—a first-grade teacher and students with another first-grade class—is most beneficial. The children are more interested in being buddies with students in the same grade, and teachers at the same grade level can better focus on issues related to the mathematics being explored. Sharing school and home telephone numbers is very helpful. For example, when one student's buddy was absent for the three days before a scheduled data exchange, the teachers quickly discussed the situation and established a way for those buddies to continue the project's activities. Setting a time frame for the completion of the project and the dates for all the exchanges minimizes potential troubles caused by varying school schedules. The time frame also aids teachers in determining on which days and in which weeks they will focus on the project. This scheduling is very important because the entire

project typically spans eight to ten weeks and represents only part of the mathematics curriculum. Developing a set of four questions to initiate the children's data gathering is a vital part of this planning meeting. These questions serve as models for the children throughout the project and furnish a springboard for students' thinking.

Gathering and Representing the Data

The classes launch the project with a version of the scenario presented at the beginning of this article. Children are told that each student in the class is "buddied up" with a student from another class; their task is to find out important information about their buddies. They are also told that they will meet their buddies at the end of the project and need to be able to identify them. Children are informed that the only means for communicating with their buddies is in writing and that one way to get information about other people is through survey questions. These discussions inevitably focus on the question, "What data about our buddies should we gather?" Teachers share the previously determined four questions and

ask children to think of additional questions. These student-generated questions are written on the chalkboard, and children select two to add to their initial surveys. A sample of these questions is presented in **table 3.**

TABLE 3
Sample Questions: Data Buddies
Teacher-generated questions:
What is your name?
Are you a boy or a girl?
What color are your eyes?
What color is your hair?
Student-generated questions:
What color is your skin?
Do you have freckles?
Do you wear glasses?

Survey Exchange 1

The first survey forms are constructed by the children. The teachers exchange the forms and distribute them. Each student then responds to the survey questions from his or her buddy, and the teachers exchange the completed surveys using the procedures they have established.

When the first set of completed surveys arrives, the children examine the data they have gathered about their buddies and share their newly gained information with their peers and the teacher. As a way of organizing the data, each child makes a Buddy Book to store both the buddy's completed survey and a pictorial record of the data.

Graphs of the data, such as gender, eye color, and hair color, are constructed. These representations of the "other class," which are usually tally charts or simple bar graphs, motivate children to gather and display similar data about their own class. As children talk about their buddy, make their buddy picture, and create the graphs of these data, they note that they need more information, especially about the physical characteristics of their buddy. This observation fosters discussions in which the children realize the need for much more refined questions about their buddy's physical characteristics. For example, in the first exchange, the children asked their buddy to tell them about hair color. However, as children think about these data, they discover that they lack other important information about their buddy's hair. Is their buddy's hair straight, wavy, or curly? How long is it? What does *short* mean? What questions should we ask to get accurate information? These discussions allow teachers truly to "orchestrate discourse" (NCTM 1991, 34). Children then typically suggest additional survey questions, present their rationale for these questions,

and debate which questions actually to include. To remind children of the purpose for these questions, teachers frequently ask, "Why do you want to ask that question?" In this way, these teachers are able to engage first and second graders in substantive mathematical activity in a truly meaningful way.

Survey Exchange 2

During the project-planning meeting, the teachers decided to have each student create a life-sized replica of his or her buddy. This activity presents a realistic purpose for having the children collect, organize, and analyze some continuous, numerical data—for example, height—in addition to categorical or discrete data—for example, gender.

When teachers share the idea of making these life-sized replicas, discussion focuses on the additional data needed to facilitate such a creation. Students again engage in a rich mathematical problem-solving opportunity. The children often realize that their buddy's height would be a useful piece of data, which leads to a discussion of how they might gather this information. Children have made the following suggestions:

- "Go to the school nurse and have her give us a list of our heights."
- "Measure everybody in the room using connecting links."
- "Have each person in the room stand next to a strip of paper, mark their height, and then write their name by the mark so their buddy knows it's them."

Measuring height in links is often the method chosen. The children then agree that everyone needs to ask "How many links tall are you?" on the next survey. They generate additional questions that will furnish more refined data about their buddy's physical characteristics. From this list the children select four questions to use in their second survey. The students construct their second survey, and these surveys are then sent to their buddies.

While awaiting the return of the completed second surveys, each child again has the opportunity to gather more refined data on the physical characteristics of her or his own classmates. For example, heights are measured, the length and type—wavy, curly, straight—of everyone's hair are determined, and the number and location of missing teeth are identified. These data are organized and represented in tally charts or bar graphs.

Survey Exchange 3

When the second set of surveys arrives, the data are discussed, organized, and represented using the Buddy Books. New, more refined, pictorial repre-

sentations of the buddies are created (see **fig. 1**). The students now feel that they have enough information about their buddies to be able to identify them. The question-generating discussions shift focus. Students want to know about their buddy's preferences and ask for other personal information:

- "What is your favorite color?"
- "What is your favorite outfit to wear?"
- "What kind of pet do you have?"
- "How many sisters do you have?"

Such questions are used in the third, and final, set of surveys.

The third set of survey forms are exchanged, and the data are once again gathered, organized, and represented. The children begin the task of constructing the life-sized replica of their buddy. Children need to determine how they will draw their buddy with somewhat accurate proportions. Strategies are discussed. Students decide to use as templates those classmates who most closely approximate the height of a buddy. Each "template" is traced on butcher paper. Data that physically describe the buddies are transferred from the students' Buddy Books and the pictorial representations. Personal preferences and other personal data are arranged around the life-sized replica. (See **fig. 2**.)

FIGURE 1

Buddy outline sample: Data Buddies

My Buddy

My Name
Sam

My Buddy's Name
Michael
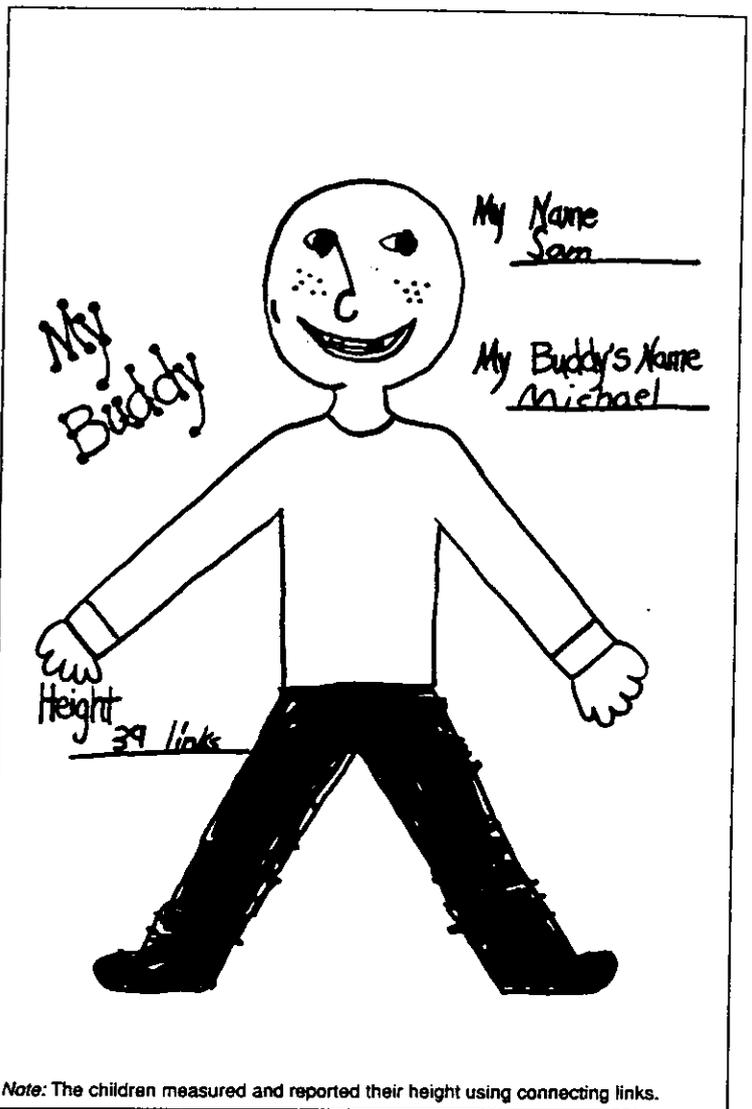
Height
39 links

Note: The children measured and reported their height using connecting links.

FIGURE 2

A sample life-sized replica

Exchanging the life-sized replicas

When the life-sized replicas are exchanged, teachers hang them up in the classroom and ask students, "Which one are you? How do you know?" Because no names are written on the life-sized replicas, children carefully examine the data presented visually. This process also causes children to think about the data they gave their buddy. Several children have difficulty identifying their replica, which opens another opportunity for teachers and children to consider the need for great clarity when using surveys to gather data. This difficulty supplies a meaningful context for discussing the ways questions on surveys are open to interpretation, even when great care is taken in their creation. For example, in response to "What color is your hair?" the data from one class included

FIGURE 3

Sample graphs comparing the eye color of two classes: Data Buddies

As an assess- ment, they play "mystery buddy"

"brown-blond," "red-brown," and "black-brown." These data caused some confusion because the question-writers thought that their buddies would only respond "blonde," "black," "brown," or "red." The idea that the accuracy of some data may change over time is also explored. For example, children who reported on the survey that they had two teeth missing, and were drawn that way, were now missing three or four teeth.

Analyzing and Interpreting the Data

Data analysis and interpretation are ongoing aspects of the project. After each set of surveys is returned, children share the data they have gathered. Most often the data analysis and interpretation begin with a student's question, for example, "Are there more girls or boys in our class? Is that like our buddy-class?" Teachers turn these questions over to the children as problems to solve, and discussions ensue about how such a question can be answered. Sometimes bar graphs or tally charts of the related data from the buddy-class are constructed and compared with graphs of similar data from the children's own class. Other times the questions are answered more informally. For example, when a student wondered, "How many buddies have freckles?" he

simply asked children whose buddies had freckles to stand on one side of the room. He then counted and proudly stated that he knew that "five buddies have freckles." Another student, following up on this question, had the freckled children in the class stand. She counted these children and commented, "We have one more kid with freckles than our buddy-class."

The whole-class graphs also serve as a means for exploring the realm of descriptive statistics, especially the concepts of mode and median. Because most of the data the children gather are discrete and categorical, the teachers begin this mathematical exploration by focusing on the mode. Teachers use both *most* and *typical* when setting the stage for these explorations:

- "Are most of Ms. Watson's kids boys or girls?"
- "What is the typical eye color for the kids in Mrs. Montellano's class?" (See **fig. 3.**)
- "What kind of pet do most kids in Mrs. Bridgman's room have?"

A few teachers decide to explore the concept of median with their students. The data for this investigation are the only continuous, numerical data that the children had gathered, their own and their buddy-class's heights. Specifically, the children engage in locating the middle number in a sequential listing of the heights for each class. A median for the class is determined by having the children line up in increasing order of height and repeatedly removing the end persons from the line. In one class of twenty-four children, the teacher adroitly left the two center people standing and assisted the children in determining that the middle number would be between the heights of these two children.

One assessment component used at this point in the project is the creation of a picture "from the shoulders up" of the typical student in their own class and in their buddy-class. In this task the mathematical power of these first and second graders is evident. In creating portraits of typical students, children interpret many different displays of data, such as gender, hair color, hair length, hair type, and skin color. (See **fig. 4.**) Teachers have reported that almost all children successfully create the picture, take great care in including the important data, and enjoy the task. This success has informed all the project's participants about what children can accomplish when they are meaningfully engaged in mathematics.

Data Buddy Day

Finally the day is here! The buddies are coming! Many children are wearing the outfit they had told their buddy was their favorite. A bus pulls up in

front of the school. The air is filled with excited children's voices. "That must be Kathy! She's wearing purple shoes!" "He's wearing glasses. He's gotta be Nathan."

The culminating activity for the project, the face-to-face meeting of the buddies, occurs on a previously planned day at an agreed-to location, typically one of the schools or a park close to both schools. Data Buddy Day allows each buddy-pair finally to meet, talk about the project, ask additional questions, and enjoy each other's company.

Data Buddy Day also allows teachers to assess their students' learning innovatively by playing a game called "mystery buddy." In the game teachers secretly select a student. The children then ask questions that could be answered either "yes" or "no" to determine the "mystery buddy": "Is the mystery buddy a girl?" "Does the mystery buddy have black hair?" "Is Sandy the mystery buddy?" Teachers keep track of the kinds of questions the children ask as well as the number of questions they need to identify the "mystery buddy" successfully. One measure of success for the project is how quickly almost all the children are able to determine the types of data that are most useful in identifying the "mystery buddy" and the types of questions that would best gather the requisite data.

As a follow-up to Data Buddy Day, children write entries in their mathematics journals describing what they learned about their buddy and about the project. (See **fig. 5.**) This activity gives teachers one more means for assessing students' attainment of the goals for the project.

Reflections on the Data Buddies Project

In the section on teaching standards of the *Professional Standards for Teaching Mathematics* (NCTM 1991), four components of teaching mathematics are discussed: tasks, discourse, environment, and analysis. Through their involvement with the Data Buddies Project, teachers have had opportunities to engage in thoughtful consideration of teaching and learning mathematics in the primary grades. Their reflection has led to an awareness of new ways of teaching and has enhanced their professional growth in the following manner.

- These teachers carefully consider the worth of the instructional tasks they present to their students. Using the tasks in this project and the way in which they were developed, implemented, revised, and refined as a model, teachers now more frequently present tasks that are based on sound, significant mathematics and are interesting and relevant to their students.

Sample student-constructed graphs and typical-child picture: Data Buddies
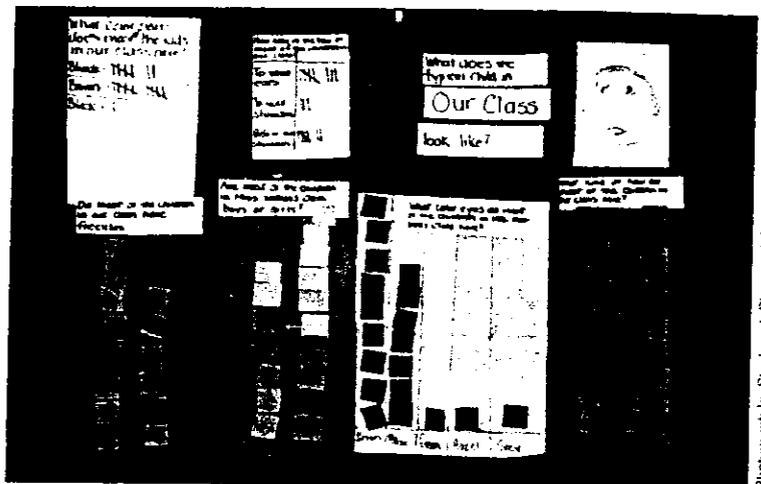
Sample student mathematics journal entry: Data Buddies

- These teachers are more aware of the patterns of discourse in their classrooms and are better "orchestrators" of such discourse. They listen better to the ideas that children share in their classrooms. They attend to, and base their teaching on, children's verbal and written comments.

- These teachers are more willing to take risks. Thus their classroom environments have changed. Teachers are more comfortable exploring mathematics with their students. More children are participating in constructing mathematical ideas.

- These teachers are more reflective about teaching mathematics. Being part of a team of primary-grade teachers throughout the cyclical process of
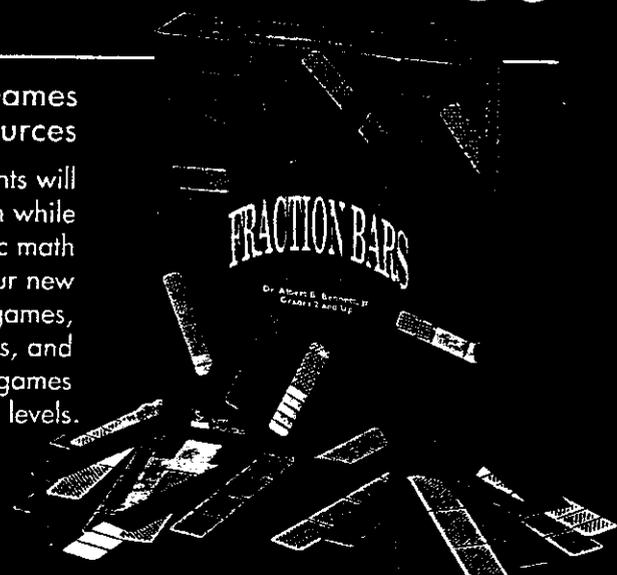
developing, implementing, and evaluating this project has supported them as they worked with others, shared ideas, celebrated both their successes and the successes of their students, and examined their own professional growth as mathematics teachers. In this way, the Data Buddies Project has fostered a sense of community that is sorely needed if teachers are to actualize the calls for improved mathematics teaching and learning that are central to the vision for mathematics curriculum and teaching.

With the children and teachers who have participated in the Data Buddies Project during the last three years, the author encourages readers to explore the "world of data" through such a project. Every teacher and class should find the exploration to be a meaningful and exciting way to develop mathematics success and mathematics power.

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from Mary Ellen Snodgrass
704-324-0155

Ancient Rome

Literature/Language/Research   **Crafts/Group Discussion**

Historical Events

In 753 B. C., Romulus became

Rome's first king.

a. Make a historical chart of Rome's
early kings. List accomplishments
of each, particularly the noted builders.
What early buildings still remain?
Which predate the Romans? Who built
them?

b. Outline a walking tour of
early Roman architecture on
a street map. Provide
commentary on building
methods, particularly the use
of concrete, the barrel vault,
and the Roman arch. Draw
symbols to indicate
government buildings,
churches, schools, parks, and
commercial centers.

c. Compare the story of Romulus and
his brother Remus to that of Cain
and Abel from the book of Genesis.
Why do you think this plot is
common in world literature? What
theme appears in both stories?
Explain the term archetype.

Rome gave up its monarchy in 509 B. C. and established a republic.

•Define <u>republic</u>. Explain the difference between republic and democracy.

•Which system does our country use? Compose a paragraph in which you explain why the size of a country helps to determine the type of government it needs.

a. Study the creation of early timepieces. Include the water clock, sun dial, and hour candle. What are the advantages and disadvantages of each type. Draw a schematic study of one of these. Include front view as well as both sides, top, back, and bottom.

b. Discuss why bells were important to community life in early Rome. How can a bell system help people keep standard time?

Terence (186-159 B. C.) wrote comedies for Rome's theater.

Roman comedy copied the

stage plays of the Greeks, but added more colorful costumes, dancing, gymnastics, even tap dancers. Sketch a scene for a Roman play about Saturnalia, an annual holiday during which slaves and masters trade places so that masters obey their slaves. Choose a part for yourself.

a. Roman illnesses were treated with a wide assortment of herbs and ointments imported from the Mediterranean world. Why was mandragora a useful painkiller? From what plant did it derive?

b. Suggest other types of painkillers that Romans might have preferred. One of the most common in our time—ice—would have been difficult to obtain. Summarize from a first aid manual why ice is effective for sprains, backaches, bruises, burns, and nosebleed.

Julius Caesar was born in 100 B. C. and was assassinated in 44 B. C.

a. Why is Gaius Julius Caesar considered a member of the Julian family?

What did he name his daughter?

b. Look up the meanings of Roman nicknames, such as Calvus, which meant bald. Find these: Rufus, Crispus, Africanus, Naso, and Torquatus. Create a list of your own. Use a Latin dictionary to help you translate them into the appropriate Roman term.

Rome's legionaires were the world's best trained soldiers. Why were discipline and obedience important parts of an officer's duties? Discuss with a group how the work of a military leader has changed since the invention of the walkie-talkie, the computer, and remote-control weapons.

a. Why would loyal Romans plot to kill Caesar? List three reasons why he might have proved dangerous to the Republic.

b. Why did ten years separate his death from the beginning of the Roman Empire?

c. In what reference books would you find the most information about this turbulent era? What reference books would show you Caesar's travels?

To be prepared for a future characterized by change, students must learn to think rationally and creatively, solve problems, manage and retrieve information, and communicate effectively. By mastering **information problem-solving skills** students will be ready for an information-based society and a technological workplace.

Information literacy is the term being applied to the skills of information problem-solving. The purpose of this position paper is to identify the key elements of information literacy and present a rationale for integrating information literacy into all aspects of the K-12 and post-secondary curriculum. Many aspects of both the school restructuring movement and library media programs relate directly to information literacy and its impact on student learning.

Today, many different groups are helping to define information literacy. For example, information literacy is one of five essential competencies for solid job performance according to the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS). The SCANS report makes the case for developing **high-performance skills** to support an economy characterized by high skills, high wages, and full employment. A high-skill workforce is also called for in President Clinton's National Technology Policy for America.

Educators are recognizing the importance of information literacy. In 1991, the Association of Supervision and Curriculum Development (ASCD) adopted the following statements:

Information literacy...equips individuals to take advantage of the opportunities inherent in the global information society. Information literacy should be a part of every student's educational experience. ASCD urges schools, colleges, and universities to integrate information literacy programs into learning programs for all students.

ASCD is one of 60 educational associations which have formed the National Forum on Information Literacy (NFIL).

RESTRUCTURING AND INFORMATION LITERACY

Research on the restructuring of schools calls for the teacher's role to change from a textbook lecturer to that of a coach. Students become active learners who create their own knowledge after interacting with information from a variety of resources. Learning which results from use of multiple resources is often referred to as **resource-based learning.**

Resource-based learning requires that students are effective users of information regardless of format. Print resources such as books and magazines as well as electronic resources such as computer databases and laser videodiscs will be used by students. Students will master information literacy skills when teachers and library media specialists guide them as they use information with a discipline or through an interdisciplinary project.

Another component of restructuring, **performance assessment,** flows from active resource-based learning. Learning is assessed by observing student demonstrations of ability, knowledge or competencies. In a fully functioning performance assessment setting, student portfolios and other assessment techniques are used to measure **outcomes** or **competencies.**

CURRICULUM AND INFORMATION LITERACY

To become effective information users, students must have frequent opportunities to handle all kinds of information. Locating, interpreting, analyzing, synthesizing, evaluating, and communicating information should become a part of every subject across the curriculum. Resource-based learning calls for all members of the educational community to become partners in a shared goal,

providing successful learning experiences for all students. Learning environments should be structured to allow students unlimited access to multiple resources in the classroom, the library media center, and beyond the school walls.

The principal, as instructional leader, fosters resource-based learning by providing adequate planning time and budget support. As instructional partners, the classroom teacher and library media specialist are actively involved in identifying the learning needs of the students, developing teaching units, and guiding their progress. The library media specialist facilitates activities which offer meaningful practice in using a variety of information resources.

In an effective information literacy curriculum, the student's experience with information moves away from learning traditional library location skills taught in isolation. Rather, the student learns information literacy skills, as defined in this paper, embedded into the core curriculum. Once acquired, a solid foundation of information literacy skills will prepare students for a lifetime of learning.

LIBRARY MEDIA PROGRAMS

The role of the library media program is to ensure that students and staff are effective users of ideas and information. The library media program supports the curriculum by providing adequate resources, personnel and training so that both students and teachers become independent users of information.

The library media specialist plays a critical role in a school's instructional program. To foster information literacy, the library media specialist:

- Works with the classroom teacher as a partner to plan, design, deliver, and evaluate instruction using a variety of resources and information problem-solving skills.
- Serves as a teacher and consultant in the transition from a textbook centered classroom to a resource-based classroom.
- Provides leadership, expertise and advocacy in the use of technology and resources.
- Partners with teachers to empower students to accept responsibility for their own learning, thereby becoming capable of learning over a lifetime.
- Manages a program (personnel, resources, facility, and services) in which students receive instruction and practice in the use of information. Guidance is given for reading, viewing, and listening so that students can locate resources for both personal enrichment as well as for information problem-solving.

A school library media program that is truly integrated into the school's curriculum is central to helping students master information literacy skills.

"Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand."
-ALA Presidential Committee on Information Literacy

AASL

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Information Problem-Solving Skills

INTRODUCTION

The ability to access and use information is necessary for success in school, work and personal life. The following steps represent the basic element in an information literacy curriculum.

I. DEFINING THE NEED FOR INFORMATION

The first step in the information problem solving process is to recognize that an information need exists and to define that need. The student will be able to:
A. Recognize different uses of information (i.e. occupational, intellectual, recreational)
B. Place the information needed within a frame of reference (who, what, when, where, how, why)
C. Relate the information needed to prior knowledge
D. Formulate the information problem using a variety of questioning skills (i.e. yes/no, open ended)

II. INITIATING THE SEARCH STRATEGY

Once the information problem has been formulated, the student must understand that a plan for searching has to be developed. The student will be able to:
A. Determine what information is needed, often through a series of sub-questions
B. Brainstorm ideas and recognize a variety of visual ways of organize ideas to visualize relationships among them (i.e. webbing, outlining, listing)
C. Select and use a visual organizer appropriate to subject
D. List key words, concepts, subject headings, descriptors
E. Explain the importance of using more than one source of information
F. Identify potential sources of information
G. Identify the criteria for evaluating possible sources (i.e. timeliness, format, appropriateness)

III. LOCATING THE RESOURCES

At the onset of a search a student will recognize the importance of locating information from a variety of sources and accessing specific information found within an individual resource. The student will be able to:
A. Locate print, audiovisual, and computerized resources in the school library media center using catalogs and other bibliographic tools
B. Locate information outside of the school library media center through online databases, interlibrary loan, telephone and facsimile technology
C. Identify and use community information agencies (i.e. public and academic libraries, government offices) to locate additional resources
D. Use people as sources of information through interviews, surveys and letters of inquiry
E. Consult with library media specialists and teachers to assist in identifying sources of information
F. Access specific information within resources by using internal organizers (i.e. indexes, tables of contents, cross references) and electronic search strategies (i.e. keywords, boolean logic)

"Library media specialists help students build positive attitudes toward the use and communication of ideas."
-Information Power

p. 2

IV. ASSESSING AND COMPREHENDING THE INFORMATION

Once potentially useful information has been located, the student uses a screening process to determine the usefulness of the information. The student will be able to:

A. Skim and scan for major ideas and keywords to identify relevant information
B. Differentiate between primary and secondary sources
C. Determine the authoritativeness, currentness and reliability of the information
D. Differentiate among fact, opinion, propaganda, point of view, and bias
E. Recognize errors in logic
F. Recognize omissions, if any, in information
G. Classify, group or label the information
H. Recognize interrelationships among concepts
I. Differentiate between cause and effect
J. Identify points of agreement and disagreement among sources
K. Select information in formats most appropriate to the student's individual learning style
L. Revise and redefine the information problem if necessary

V. INTERPRETING THE INFORMATION

Following an assessment of the information, the student must use the information to solve the particular information problem. The student will be able to:

A. Summarize the information in the student's own words; paraphrase or quote important facts and details when necessary for accuracy and clarity
B. Synthesize newly gathered information with previous information
C. Organize and analyze information in a new way
D. Compare information gathered with the original problem and adjust strategies, locate additional information or re-examine information when necessary
E. Draw conclusions based on the information gathered and the student's interpretation of it

VI. COMMUNICATING THE INFORMATION

The student must be able to organize and communicate the results of the information problem-solving effort. The student will be able to:

A. Use the search information to identify the important conclusions or resolutions to the problem to be shared with others
B. Decide on a purpose (i.e. to inform, persuade, entertain) for communicating the information and identify the intended audience
C. Choose a format (i.e. written, oral, visual) appropriate for the audience and purpose
D. Create an original product (i.e. speech, research paper, videotape, drama)
E. Provide appropriate documentation (i.e. bibliography) and comply with copyright law

VII. EVALUATING THE PRODUCT AND PROCESS

Evaluation is the ability to determine how well the final product resolved the information problem and if the steps taken to reach the desired outcome were appropriate and efficient. Students may evaluate their own work and/or be evaluated by others (i.e. classmates, teachers, library media staff, parents). The student will be able to:

A. Determine the extent to which the conclusions and project met the defined information need and/or satisfied the assignment. (i.e. how well did I do?)
B. Consider if the research question/problem, search strategy, resources, or interpretation should have been expanded, revised or otherwise modified.(i.e. what could/should I have done differently?)
C. Re-assess his/her understanding of the process and identify steps which need further understanding, skill development, or practice (i.e. how can I do better in the future?)

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Information Literacy in Action

Students practice information literacy in many different ways. In the following scenarios that **exemplify cooperative instructional efforts between teachers and library media specialists**, students demonstrate their information problem-solving skills through significant learning experiences.

Scenario #1 - Three students in the elementary school library media center are working at a multimedia workstation completing a report of interviews with elderly community residents. They are incorporating stories about their community during World War I, photos of some of the community residents, photos of the community from that period of time and a table with community population figures. This report will go into each child's portfolio.

Scenario #2 - In the middle school media center students are using electronic mail to work with scientists and other students on the International Arctic Project. Using the Internet, an international electronic communication network, students are sharing data from their own lake study project with students as far away as Russia. They are also following an arctic training expedition, questioning and receiving information from the explorers.

Scenario #3 - In the high school library media center students are preparing to produce a video news report set in the Civil War. They are searching the school district online catalog, a database of statewide library resources and online historical magazine indexes and a laserdisc of resources from the Library of Congress. Among the resources selected by one student are primary source newspapers, a videotaped documentary, an audio recording of folk songs, along with books and magazine articles. Electronic mail is used to request some items through interlibrary loan.

Scenario #4 - Elementary students who are setting up a fresh-water aquarium in their classroom during a study of aquatic life, plan their class time with the teacher before they consult and work with the library media specialist to locate and use print and nonprint sources. They collect the materials, plants, and animals based on their completed research. The teacher and library media specialist locate biological data through the internet and students confer with the local experts via telephone interview and internet e-mail.

Scenario #5 - A team of middle school teachers and the library media specialist plan a study of life in the middle ages that will involve a special mock celebration. They group students, identify projects that will be completed, and suggest roles each will play in the study. The teachers and library media specialist review the requirements and identify resources necessary, the best information access points for each group, and the most efficient scheduling of time and resource use.

Scenario #6 - Advanced high school students involved in an independent study in chemistry are matched with mentors with whom they communicate through telephone and internet. The mentors guide students in projects and suggest sources with which to work. The students negotiate with teachers on the project expectations and completion time. Information needs are formulated with the library media specialist, and materials are collected for completion of projects.

Scenario #7 - A district staff development workshop is planned by a team of curriculum personnel, principal, library media specialist and teachers. The workshop emphasis is on critical thinking skills. Information searches are completed in ERIC and other national databases to identify research in the field, people as speakers, and resources for student use. Plans are completed, packets of information collated for distribution, and the workshop sponsored.

Scenario #8 - Elementary students involved in a whole language reading program listen to storytellers of folk tales before selecting related books to read. After reading, students advise the teacher and library media specialist on the themes and characters that they think they should pursue. The students, teacher, and library media specialists locate nonprint and other print sources in local and statewide catalogs for further student reading and study. Students use gathered materials for their own storytelling festival.

Developed by the Wisconsin Educational Media Association
and endorsed by the
Wisconsin Department of Public Instruction

Survival:

-Money-

7. How did the colonists buy things? What did they use for money? We know they did not use the United States currency weuse today - because there was no "United States". If the colonists used money, what kind of money did they use?

Research the history of money in this country. Look up terms such as: currency, U.S. mint, New England shilling, pound, and the bartering system. Also research Paul Revere. What could he possibly have to do with currency?

-Mills-

8. Research mills. There were water mills and wind mills. There were undershot wheels, breast wheels, and overshot wheels. How did these differ? How did these work?

Mills served different purposes. there were gristmills, fulling mills, paper mills, querns, and bark mills. What jobs did these mills do? Did they all function the same?

For additional resources regarding Money see page .

for additional resources regarding Mills see page .

Many sick and injured Native Americans were treated by the tribe's medicine man. When colonists became ill they could visit a doctor (if there was one), a barber, a blacksmith (in some colonies), or an Apothecary's Shop. The Apothecary's Shop contained jars of various herbs and natural medicines. (It would be curious to know if any of the colonist's herbs were learned from the Native Americans.) Today, we have vaccinations or immunizations for many diseases.

Colonial women often held jobs that we later considered male roles. It wasn't until the 1800's that womens' jobs and activities became restricted. Many women held occupations such as butchers, blacksmiths, shopkeepers, fur traders, and shoemakers. It was important that females were skilled in various occupations. It was often necessary for females to hold these jobs. Men were frequently absent from the colonies and home for reasons of hunting, fighting, and government activities. The men also died earlier than the females. It was important that the wife be able to take over the husband's role.

Many shops were recognized by their sign hanging out front of their door. Shop signs were often made of wood. Often you would not recognize the shop by the words on the sign, but by the shape of the sign. Many travellers to colonies could not read. Therefore, a fish market may have a large sign shaped like a fish. An eye doctor may have a giant eye carved into wood for his sign.

How could the colonists pay for these services? If the colonists had money, what type of currency did the colonists' use? We know that prices were much different in colonial days than today. In 1630 a pound of cheese cost about 22 cents in today's currency (money). In 1775 cheese sold for around 9 cents a pound of today's money. In 1630, a pair of shoes sold for

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Maintenance:

-Money-

18. How much does it cost for a pound of cheese or a pair of shoes today? What problems do you have in reporting this information?

-Mills-

19. How many simple machines can you find in the workings of a mill?

-Community Rules-

20. What did the colonists do about common community problems such as caring for the poor, mentally ill, physically handicapped, or criminals? How were these settlers tended to?

How were colonists disciplined and controlled? Investigate words such as "stocks" and "pillory".

21. Were there any laws governing the ownership of guns? Could indentured servants own guns? Apprentices? Slaves?