



REVIEW

Vol 1 No 2 March 1991 MCI (P) No 134/9/90

*Improving Teaching
and Learning*

ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT

EXECUTIVE COUNCIL

President	<i>Dr Ang Wai Hoong</i>
President-elect	<i>Mrs Mok Choon Hoe</i>
Hon Secretary	<i>Miss Tan Siok Cheng</i>
Hon Asst Secretary	<i>Mrs Woo Yoke Yoong</i>
Hon Treasurer	<i>Mrs Tan May Yan</i>
Hon Asst Treasurer	<i>Miss Koh Sauk Yee</i>
Council Members	<i>Mrs Niva Dutt</i>
	<i>Mr Fong Whay Chong</i>
	<i>Mrs Pearl Goh</i>
	<i>Miss Kan Sou Tin</i>
	<i>Dr Low Guat Tin</i>
	<i>Mdm Sim Sock Hoon</i>
	<i>Miss Tan Teng Wah</i>
	<i>Mr Tan Yap Kwang</i>

PUBLICATIONS COMMITTEE

Editor	<i>Mr Tan Yap Kwang</i>
Members	<i>Miss Koh Sauk Yee</i>
	<i>Dr Low Guat Tin</i>
	<i>Miss Tan Teng Wah</i>
	<i>Mrs Woo Yoke Yoong</i>
	<i>Ms Zaibun Siraj</i>
Illustrator	<i>Mrs Janice Baruch</i>

ASCD (Singapore) Review is published three times a year in March, July and November. The views expressed in this journal do not necessarily reflect the official position of ASCD (Singapore).

The Publications Committee seeks articles and letters that provide useful information about the problems and ways to improve the teaching/learning process. Manuscripts should show the author's name, title and institution. Contributions could be in form of a hardcopy and/or on a 5.25" diskette. Please send all contributions to Publications Committee, ASCD (Singapore), c/o CDIS, 465E Bukit Timah Road, Singapore 1025.

Published by Association of Supervision and Curriculum Development (Singapore).

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright holder.

Printed by Mentor Printers Pte Ltd, Blk 155 Kallang Way #01-10, Singapore 1334

FOCUS: Improving Teaching and Learning

Putting Learning Strategies to Work <i>Sharon J Derry</i>	2
Enhancing Understanding Through Debriefing <i>James Rath</i>	9
Building Bridges: Strategies for Increasing Students' Word Power and Reading Comprehension <i>Quah May Ling</i>	12
Integrating Instructional Programs Through Dimensions of Learning <i>Robert J Marzano, Debra J Pickering and Ronald S Brandt</i>	18
Helping Children Learn <i>Sally Tang</i>	27
Sharing Our Instructional Secrets <i>Francis P Hunkins</i>	29
The Empowering Learners Project <i>Nora Redding</i>	32

OTHER TOPICS

Using the Outdoors: A Different Approach to Manager and Management Development <i>Kenneth Stott</i>	35
On Leadership and Student Achievement: A Conversation with Richard Andrews <i>Ron Brandt</i>	39
The Kid's-Eye View of Effective Principals <i>Carrie Kojimoto</i>	47
Humour in Education <i>P F Millington</i>	53
Diagnosis of Pupil Weaknesses in English Language Skills Through An Analysis of Cloze Passages <i>Lau Kum Leng</i>	57
Current Trends in Mathematics Learning: Problem Solving <i>Lim Lee Hean</i>	59

IDEAS

They Dared to be Different in a Week of Non-Traditional Teaching <i>Zaibun Siraj</i>	62
Read Aloud Week at Collicot School <i>William M Griffin</i>	64

SHARON J DERRY

Putting Learning Strategies to Work

By increasing students' repertoires of tactics for learning, we can prepare them to develop their own strategies for problem solving in the classroom and beyond.

Recent research in cognitive and educational psychology has led to substantial improvements in our knowledge about learning. Researchers have identified certain mental processing techniques - learning strategies - that can be taught by teachers and used by students to improve the quality of school learning. Let me illustrate.

As a professor of educational and cognitive psychology, I often begin the semester with a simulation exercise designed to illustrate major principles about the role of learning strategies in classroom instruction. For example, recently I presented my students with the following scenario:

You are a high school student who has arrived at school 20 minutes early. You discover that your first-period teacher is planning to give you a test covering Chapter 5. Unfortunately, you have prepared the wrong chapter, and there is no one around to help you out. Skipping class is not the solution, since this results in an automatic "F", and you would never dream of cheating. So you open your book and use the next 15 minutes as wisely as you can.

I gave my students 15 minutes to study. They then took a quiz with eight main idea questions and two application questions. At the end of the quiz, I asked them to write what they did when they studied. Quizzes (without names) were collected and then distributed randomly to the class for

scoring and for analyzing the study strategies reported in them

Few people performed well on this test. A student who did write the following:

There wasn't enough time for details. So I looked at the chapter summary first. Then I skimmed through the chapter and tried to understand the topic paragraphs and the summary paragraphs for each section. I also noticed what the headings said, to get the organization, and I noticed certain names that went with each heading, figuring they did something related to each topic, a study or something. I started to do some memory work on the headings, but time was up before I finished.

By comparison, most students answered only two or three of the main

Learning is a form of problem solving that involves analyzing a learning task and devising a strategy appropriate for that particular situation.

idea questions, reporting a study strategy something like the following:

Panic. There was not enough time! I started going over the chapter and got as far as I could, but it was hopeless. I assume you do not plan to grade this quiz, because that would be unfair!

As illustrated in these two examples, the differences between successful and unsuccessful learning strategies often are clear and striking. Whereas the successful learners assessed the learning situation and calmly developed a workable plan for dealing with it, the less successful learners were occupied with fruitless worries and vague strategies but little planning effort.

Such an exercise serves to introduce the following important principles about self-directed learning.

1. The plan that one uses for accomplishing a learning goal is a person's learning strategy. Learning strategies may be simple or complex, specific or vague, intelligent or unwise. Obviously, some learning strategies work better than others.

2. Learning strategies require knowledge of specific learning skills, or "tactics" (e.g. Derry and Murphy 1986), such as skimming, attending to chapter structure, and memorization techniques. The ability to devise appropriate learning strategies also requires knowledge about when and when not to use particular types of

learning tactics.

3. Learning is a form of problem solving that involves analyzing a learning task and devising a strategy appropriate for that particular situation. Different learning situations may call for different strategies.

Further, I asked my students to determine whether any reported learning strategy had produced useful knowledge. Alas, no participant had applied the knowledge acquired in the 15-minute study session to the two application questions on the quiz. Even when learning strategies are apparently successful according to one form of measurement, the resultant learning is not necessarily usable later in problem solving. Thus, we added a fourth principle to our list:

4. In most school learning situations, strategies should be devised with the aim of creating usable, rather than inert, knowledge. Clearly, not all learning strategies will lead to the formation of usable knowledge structures.

Next I shall elaborate these principles in greater detail, suggesting how they can influence classroom practice.

Strategies as Learning Plans

There is much confusion about the term *learning strategy*. The term is used to refer to (1) specific learning tactics such as rehearsal, imaging, and outlining (e.g. Cook and Mayer 1983, Levin 1986); (2) more general types of self-management activities such as planning and comprehension monitoring (e.g. Pressley et al. in press a); and (3) complex plans that combine several specific techniques (e.g. Derry and Murphy 1986, Snowman and McCown 1984).

To clarify the uses of the term, I distinguish between the specific tactics and the learning strategies that combine them. Thus, a learning strategy is a complete plan one formulates for accomplishing a learning goal; and a learning tactic is any individual processing technique one uses in service of the plan (Derry and Murphy 1986, Snowman and McCown 1984). That is, a learning strategy is the application of one or more specific learning tactics to a learning problem. Within this definition, the plethora of learning techniques (popularly called

"strategies") being promoted by various researchers and practitioners can be viewed as potentially useful learning tactics that can be applied in various combinations to accomplish different learning jobs.

This definition points to the need for two distinct types of strategies instruction: specific tactics training and training in methods for selecting and combining tactics into workable learning plans. Teachers can incorporate both types of training into regular classroom instruction by thoughtfully combining different study tactics - outlining plus positive self-talk, for example - and assigning them along with regular homework.

Learning Strategies Employ Specific Learning Tactics

In this section I discuss tactics in three major categories: (1) tactics for acquiring verbal knowledge, that is, ideas and facts fundamental to disciplines such as science, literature, and history; (2) tactics for acquiring procedural skills such as reading, using language, and solving problems that underlie various curriculum disciplines; and (3) support tactics for self-motivation, which are applicable

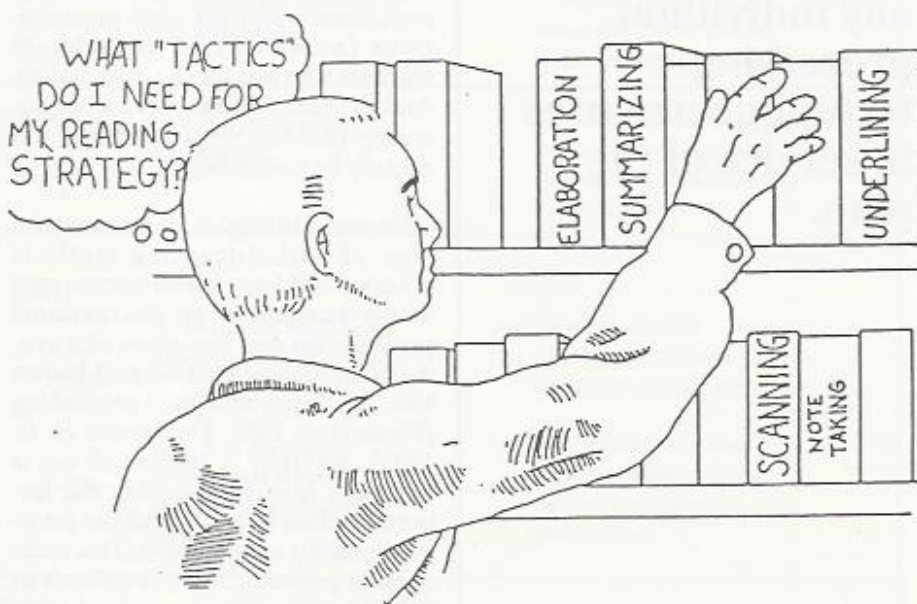
to all types of learning situations. (For a more thorough treatment of these topics, see the reviews by Derry and Murphy 1986, Weinstein and Mayer 1985, Levin 1986, and Pressley et al. in press b)

Verbal learning tactics

Strategies aimed at improving comprehension and retention of verbal information should build upon tactics that enhance these mental processes: (1) focusing attention on important ideas, (2) schema building, and (3) idea elaboration (see fig 1).

Attentional focusing. Two types of attention-focusing tactics are simple focusing and structured focusing. In the simple focusing category, highlighting and underlining are common examples. Unfortunately, the use of simple focusing procedures does not necessarily ensure identification of important information. I have often confirmed this point by requesting to see the textbooks of students who are having academic problems. Frequently I find almost every word in their texts highlighted.

Students, weaker ones in particular, should be taught to combine simple



Category	Examples	Some Conditions of Use	Strengths or Weaknesses
Attentional Focusing	Simple focusing Highlighting Underlining	Structured, easy materials. Good readers.	No emphasis on importance or conceptual relations of ideas.
	Structured focusing Looking for headings, topic sentences. Teacher-directed signaling	Poor readers. Difficult but considerate materials.	Efficient, but may not promote active elaboration, deep thinking.
Schema Building	Use of story grammars, theory schemas. Networking.	Poor text structure. Goal is to encourage active comprehension.	Inefficient, but develops higher-order thinking skills.
Idea Elaboration	Some types of self-questioning, Imagery.	Goal is to comprehend and remember specific ideas.	Powerful, easy to combine. Difficult for some students unassisted. Will not ensure focus on what is important.

Fig 1. Tactics for Learning Verbal Information

A learning strategy is a complete plan one formulates for accomplishing a learning goal; and a learning tactic is any individual processing technique one uses in service of the plan.

focusing with structured focusing, whereby the learner directs primary attention to headings, topic sentences, or other signals provided by the instructional presentation. The teaching of structured focusing is a well-established practice in English classes, and it can profitably be reinforced in other courses to help students identify information they need to learn. However, the success of structured focusing depends heavily on well-structured, considerate instructional presentations (as well as on considerate teachers who test for the main ideas). And the use of these tactics does not ensure that the ideas identified will actually be remembered.

Schema building. A more powerful type of verbal-learning tactic is schema building, which encourages active analysis of an instructional presentation and formation of a synthesizing framework. One well-known form of schema building is networking (Dansereau 1985, Dansereau et al. 1979), whereby a student draws a node-link map representing the important ideas in a text and the interrelationships among them. This technique is powerful, but it is difficult to teach and time-consuming to apply

(McKeachie 1984). Simpler forms of schema building include the use of teacher-suggested schemas, such as the well-known tactic of requiring students to analyze stories in English literature by identifying the theme, setting, plot, resolution and so on. Similar assignments can facilitate verbal learning in other courses of study. For example, Dansereau (1985) improved students' performance on science tests by teaching them to use a theory schema as a study aid for scientific text.

Schema building encourages in-depth analysis and is particularly useful if instruction is inconsiderate or unclear. Schema-building strategies are generally employed as comprehension aids; however, they also aid memory through the organization and elaboration of ideas.

Idea elaboration. Idea elaboration is a memory-enhancing process whereby students link each important new idea with prior knowledge so as to connect them. These linkages can be based on an image, a logical inference, or on anything else that serves to connect new ideas to prior knowledge (Gagne 1985).

Many elaboration tactics capitalize

on imagery, a powerful memory-enhancing technique. For example, the key-word method for acquiring foreign vocabulary involves creating a mental image (prior knowledge) representing the sound of a foreign word (new information), and relating that image to another image (prior knowledge) representing the meaning of the word's English equivalent. Many types of elaboration tactics facilitate memorization (e.g. Bransford and Stein 1984), and these can be employed to great advantage in

Procedural learning tactics

Most learning strategies research has examined tactics for acquiring verbal information. However, some strategy researchers are developing techniques for acquiring procedural skills. Procedural learning has three aspects (Anderson 1983, Gagne

1985): (1) learning how to carry out basic actions such as performing long division or executing a tennis lob; (2) learning to recognize the conceptual patterns that indicate when it is appropriate to perform particular actions (such as recognizing that a word problem is a division situation or that a tennis lob is required); and (3) learning to combine many pattern-action pairs into a smooth overall system of response. Consider, for example, the complex combining of subskills that underlies the actual playing of a tennis match.

Based on this view, Figure 2 represents three categories of mental tactics for procedural learning: (1) tactics for learning conceptual patterns that cue applicability of associated actions; (2) tactics for acquiring the component actions (performance subskills) themselves; and (3) tactics for perfecting and tuning complex overall performance.

Pattern-recognition tactics. Pattern recognition plays an important role in the development of procedural performance; however, students are probably not aware of this. Thus, developing students' procedural learning abilities includes both conveying the important function of pattern recognition and helping students develop tactics for acquiring performance-related patterns.

Examples of tactics in the patterns-acquisition category include hypothesizing and seeking reasons for actions. In applying these tactics, the learner attempts to discover the identifying features of a pattern or concept through guesswork, reasoning, and investigation. For example, while watching a tennis pro at work, the student might hypothesize about the features of play that cause the pro to execute a lob or a groundstroke. Hypotheses are confirmed or altered through continued observation, until the pattern

Category	Examples	Some Conditions of Use	Strengths or Weaknesses
Pattern Learning			
Hypothesizing	Student reasons and guesses why particular pattern is or isn't example of concept.	Goal is to learn attributes of concepts and patterns.	Inefficient unless feedback given. Encourages independent thinking.
Seeking reasons for actions	Student seeks explanations why particular actions are or are not appropriate.	Goal is to determine which procedures are required in which situations.	Develops meta-cognitive knowledge. Inefficient if not guided. If too guided, might not promote thinking skills.
Reflective Self-Instruction	Student compares reification of own performance to expert model.	Goal is to tune, improve complex skill.	Develops understanding of quality performance. May increase self-consciousness, reduce automaticity.
Practice			
Part practice	Student drills on one specific aspect of performance.	A few specific aspects of a performance need attention.	Develops subskill automaticity. Doesn't encourage subskill integration.
Whole practice	Student practices full performance without attention to subskills.	Goal is to maintain or improve skill already acquired or to integrate subskills.	May consolidate poorly executed subskills. Helps develop smooth whole performance.

Fig 2. Tactics for Learning Procedural Knowledge

Category	Examples	Some Conditions of Use	Strengths of Weaknesses
Behavioral Self-Management	Student breaks task into sub-goals, creates goal-attainment plan, rewards.	Complex, lengthy task; low motivated students.	Promotes extrinsic, rather than intrinsic, motivation. Very powerful.
Mood Management			
Positive self-talk	Student analyzes, avoids negative self-statements, creates positive self-statements.	Preparation for competitive or difficult performance; presence of negative ideas.	Good intrinsic motivator; requires conscious attention during performance.
Relaxation techniques	Student uses deep breathing, counting, other clinical relaxation methods.	Test anxiety; highly anxious students.	Techniques controversial in some districts.
Self-monitoring	Student stops self during performance to consciously check mood, progress, etc.	Goal is to increase conscious awareness and control of thinking process.	May interrupt concentration.

Fig. 3. Tactics for Developing Motivation

features are known. Alternatively, the student might seek reasons by consulting the tennis pro directly. Seeking information overcomes the major weakness of the hypothesizing tactic, inefficiency. However, the virtue of hypothesizing is that it can be used in situations where expert advice is not available.

Practice tactics. Other aspects of procedural learning include the acquisition of basic component actions (subskills) and, ultimately, the development of smooth complex performances that combine those subskills. There are learning tactics that can help students derive maximum benefit from their practice sessions. One example is part practice, whereby the student attempts to improve a complex performance by perfecting and automating an important subcomponent of that performance. For example, a student might greatly improve performance on mathematics tests by memorizing and practicing square-root tables. Or performance in tennis might be improved by concentrating practice on service and smashes. Part practice should be alternated with whole practice (Schneider 1985), whereby the student practices

the full complex performance with little attention to individual subskills.

Reflective self-instruction. Another class of procedural learning tactics is reflective self-instruction, whereby the student attempts to improve personal performance by studying an expert model. For example, a student might videotape her tennis swing and compare that to a tape of an expert's swing. Or the student might critically compare her homework solution for a geometry proof to the teacher's expert solution presented on the board. Reflective self-instruction can concentrate either on specific component subskills or on whole complex performances. One key to successful self-instruction is the availability of adequate performance models. By providing models of expert performance and guiding students in how to benefit from these models while learning, teachers can provide training in the valuable technique of reflective self-instruction.

Mental support tactics

Acquiring useful knowledge in school is a lengthy and difficult process demanding a great investment of time and effort on the part of the

student. Thus, tactics are needed for helping learners maintain a positive attitude and a high state of motivation during learning and practice. Researchers (e.g. Dansereau et al. 1979, 1985; Meichenbaum 1980; McCombs 1981-82) recommend several types of support tactics: (1) behavioral self-management, (2) mood management, and (3) self-monitoring (see fig 3).

The behavioral self-management category includes such tactics as breaking a complex learning chore into subgoals, developing a schedule for meeting subgoals, devising a reporting procedure for charting progress, and devising a self-reward system for completing major subgoals. Mood management tactics include concentration and relaxation techniques (useful for combating test anxiety); and positive self-talk, used to establish and maintain a positive frame of mind before and during learning and performance (e.g. Meichenbaum 1980). Finally, an example of self-monitoring is the technique of stopping periodically during learning and practice to check and, if necessary, readjust strategy, concentration, and mood.

Frequently used by professional athletes, mental support tactics can also

be used by students to increase academic performance and motivation and to decrease tension associated with evaluation. They are applicable to all types of learning situations and can be combined with both verbal and procedural learning tactics in study assignments. For example, to study for a history test, a student might devise a learning strategy that orchestrates several specific tactics, such as positive self-talk with self-checking (to maintain motivation), networking (to help organize facts in a meaningful way), and use of imagery or mnemonics (to help with memorization).

Strategy-Building as Problem Solving

The ultimate aim of tactics training is to provide students with tools that will enable them, as autonomous learners, to devise their own strategies. Unfortunately, a persistent problem in strategy training has been students' failure to apply tactics in situations outside the class in which they were learned originally.

However, several training techniques can alleviate these problems. A large number of researchers (e.g. Baron 1981, Bransford and Stein 1984) suggest teaching students to respond to all learning tasks using a general problem-solving model. For example, Derry, Jacobs and Murphy (1987) taught soldiers to use the "4C's"

Verbal information is likely to be called into service only if it is understood when learned and only if it is stored in memory within well-structured, well-elaborated networks of meaningfully related ideas.

to develop plans for study reading. The 4C's stood for: clarify learning situation, construct a learning strategy, carry out the strategy, and check results.

One presumed advantage of such plans is that they remind students to stop and think reflectively about each learning situation prior to proceeding with the task (Baron 1981). Also, such plans may serve as mnemonic devices that help students recall previously learned tactics associated with each step. There is some empirical support for the idea that problem-solving models enhance tactics transfer (Belmont et al. 1982).

Another procedure for inducing tactics transfer is informed training (Campione et al. 1982, Pressley et al. 1984). This procedure enhances direct tactics instruction with explicit information regarding the effectiveness of various tactics, including how and when they should be used. As Levin (1986) points out, there are different learning tools for different jobs. With informed training, students learn that tactics selection is always influenced by the nature of the instructional material as well as the nature of the learning goal. For example, if a text is not highly structured and the primary aim of study is to comprehend and remember important ideas, a strategy that combines networking with idea elaboration would be appropriate. However, if the aim is primarily comprehension rather than retention, a schema-building technique along would suffice. Informed training is superior to "blind training" in producing transfer and sustained use of specific learning tactics (Pressley et al. 1984, Campione et al. 1982).

Previously I suggested that teachers can help develop students' learning skills by devising, assigning, and explaining learning strategies and by providing feedback on strategy use. Such established classroom practices are excellent vehicles for informed training.

Learning Strategies Should Produce Useful Knowledge

Cognitive psychology has taught us much about the nature and structure of usable knowledge. Verbal information is likely to be called into service only if it is understood when learned

Two distinct types of strategies instruction: specific tactics training and training in methods for selecting and combining tactics into workable learning plans.

and only if it is stored in memory within well-structured, well-elaborated networks of meaningfully related ideas. Procedural skills, on the other hand, are likely to be accessed and accurately executed only if they have been developed through extensive practice and only if the environmental patterns that indicate their applicability are well learned. If the primary aim of schooling is the creation of useful knowledge, then strategy application should result in the deliberate creation of a well-structured knowledge base, whether verbal, procedural, or both.

It is unlikely that reliance on any single learning tactic alone will ensure the creation of well-constructed knowledge. Rather, multiple tactics are usually required. For example, if an elaboration technique is applied for the purpose of enhancing individual ideas, another schema-building tactic may be needed to tie related ideas together. Or if practice is used to perfect a specific aspect of procedural performance, a pattern-learning tactic

may still be needed to ensure that the skill is executed only when appropriate. Thus, useful knowledge is most likely to evolve through a dynamic process requiring, first, an informed analysis of each learning problem, then selection and combining of all the learning tactics needed to produce a well-formed mental structure.

Not every learning strategy produces useful knowledge. Some strategies lead to isolated, unstructured bits of learning that will remain forever inert. For this reason, both teachers and students should be aware of the nature and form of useful knowledge and of learning strategies that are likely to facilitate its creation.

Strategy Training for Lifelong Learning

Students who receive good strategy training during their years in school can acquire a form of knowledge especially useful in coping with the wide variety of learning situations they will encounter throughout their lives. Given the amount of time that people spend in school, in job-related training, and in acquiring knowledge associated with their interests and hobbies, the ability to find good solutions to learning problems may be the most important thinking skill of all.

References

- Anderson, J.R. (1983). *The Architecture of Cognition*. Cambridge, Mass.: Harvard University Press.
- Baron, J. (1981). "Reflective Thinking as a Goal of Education." *Intelligence* 5: 291-309.
- Belmont, J.M., E.C. Butterfield, and R.P. Ferretti (1982). "To Secure Transfer of Training Instruct Self-Management Skills." In *How and How Much Can Intelligence Be Increased*, edited by D.K. Detterman and R.J. Sternberg, pp. 147-154. Norwood, N.J.:ABLEX.
- Bransford, J.D., and B.S.Stein. (1984). *The Ideal Problem Solver: A Guide For Improving Thinking, Learning, and Creativity*. New York: Freeman.
- Campione, J.C., A.L. Brown, and R.A. Ferrara. (1982). "Mental Retardation and Intelligence." In *Cognitive Strategy Research: Educational Applications*, edited by R.J. Sternberg, pp. 87-126. New York: Springer-Verlag.
- Cook, L.K., and R.E. Mayer. (1983). "Reading Strategies Training for Meaningful Learning from Prose." In *Thinking and Learning Skills*, edited by J.W. Segal, S.F. Chipman, and R. Glaser, vol 1, pp 209-240. Hillsdale, N.J.: Erlbaum.
- Dansereau, D.F., K.W. Collins, B.A. McDonald, C.D. Holley, J.C. Garland, G.M. Dickhoff, and S.H. Evans. (1979). "Development and Evaluation of an Effective Learning Strategy Program." *Journal of Educational Psychology* 79: 64-73.
- Derry, S.J., J. Jacobs, and D.A. Murphy. (1987). "The JSEP Learning Skills Training System." *Journal of Educational Technology Systems* 15, 4: 273-284.
- Derry, S.J., and D.A. Murphy. (1986). "Designing Systems That Train Learning Ability: From Theory to Practice" *Review of Educational Research* 56, 1: 1-39.
- Gagne, E.D. (1985). *The Cognitive Psychology of School Learning*. Boston: Little, Brown and Company.
- Levin, J.R. (1986). "Four Cognitive Principles of Learning-Strategy Instruction." *Educational Psychologist* 21, 1 and 2: 3-17.
- McCombs, B.L. (1981-1982) "Transitioning Learning Strategies Research in Practice: Focus on the Student in Technical Training." *Journal of Instructional Development* 5: 10-17.
- McKeachie, W.J. (1984) "Spatial Strategies: Critique and Educational Implications." In *Spatial Learning Strategies: Techniques, Applications, and Related Issues*, edited by C.D. Holley and D.F. Dansereau, pp. 301-312. Orlando, Fla: Academic Press.
- Meichenbaum, D.H. (1980). "A Cognitive-Behavioral Perspective on Intelligence." *Intelligence* 4: 271-283.
- Pressley, M., J.G. Borkowski, and J.T.O'Sullivan. (1984). "Memory Strategy Instruction Is Made Of This: Metamemory and Durable Strategy Use." *Educational Psychologist* 19:94-107.
- Pressley, M., J.G. Borkowski, and W. Schneider. (In press a). "Cognitive Strategies: Good Strategy Users Coordinate Metacognition and Knowledge." In *Annals of Child Development*, edited by R. Vasta and G. Whitehurst, vol. 4. Greenwich, Conn.:JAI Press.
- Schneider, W. (1985) "Training High-Performance Skills: Fallacies and Guidelines." *Human Factors* 27: 285-300.
- Snowman, J., and R. McCown (April 1984). "Cognitive Processes In Learning: A Model for Investigating Strategies and Tactics." Paper presented at the annual meeting of the American Educational Research Association, New Orleans.
- Weinstein, C.E., and R.E. Mayer (1985). "The Teaching of Learning Strategies." In *Handbook of Research on Teaching*, 3rd ed., edited by M.C. Wittrock. New York: Macmillan.

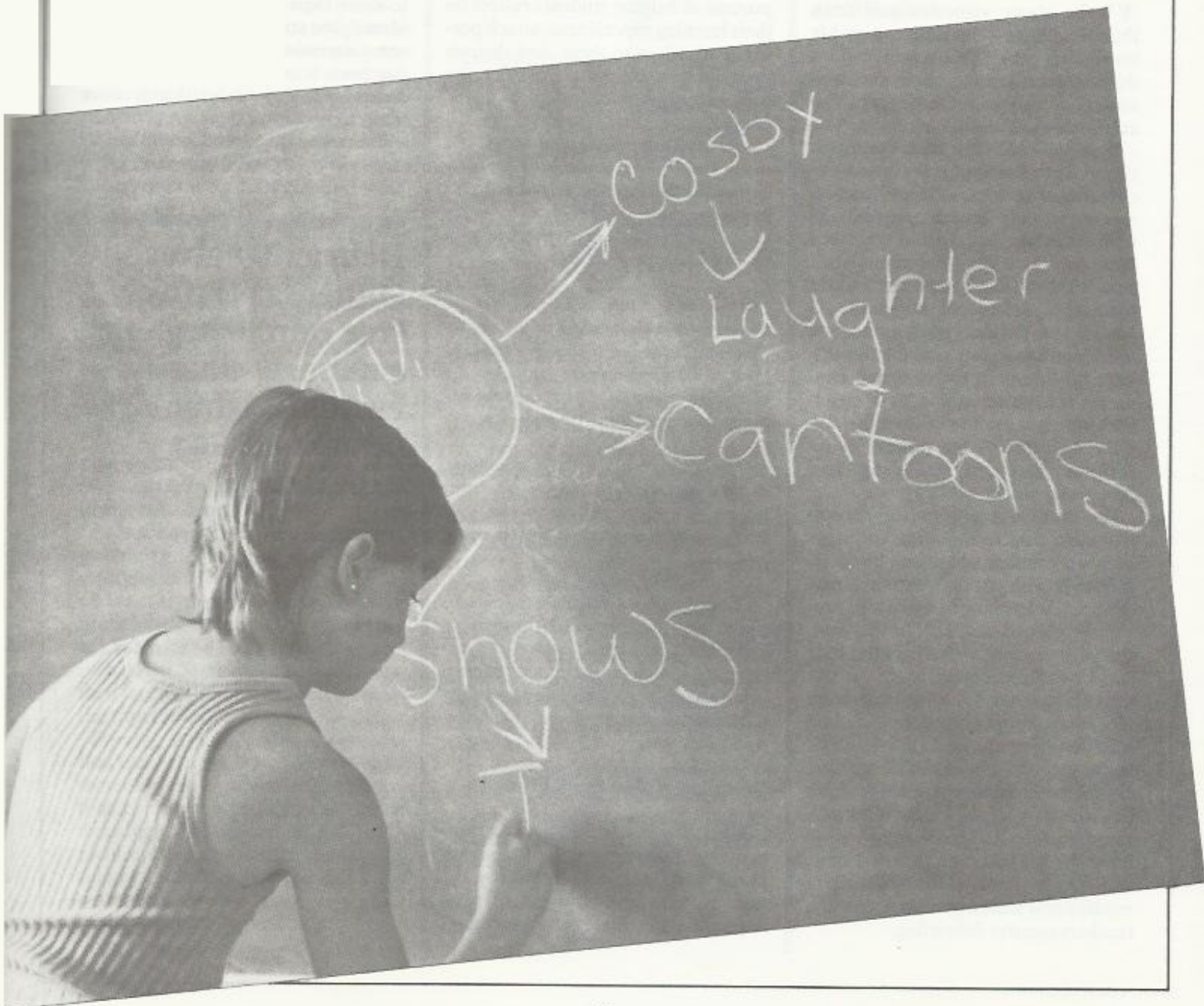
Sharon J. Derry is Associate Professor and Chair, Cognitive and Behavioral Sciences, Department of Psychology, Florida State University, Tallahassee, FL. 32306-1051.

Reprinted with permission from *Educational Leadership* (Dec 88/Jan 89).

JAMES RATHS

Enhancing Understanding Through Debriefing

Giving students opportunities to reflect on and explain the meaning of their experiences can help them integrate and retain new learning



Students in a tenth-grade class read an article in the class newspaper that discusses the probability that life exists on other planets. After asking a series of who, what, and where questions, the teacher shifts the discussion to another item in the newspaper.

Taking turns reading aloud, students in an honors English class hear recounted the agony of Oedipus' making his horrifying discovery. The teacher asks several questions about the facts of the matter, and soon discussion of tomorrow's quiz dominates the interaction.

What meanings did the students in the above vignettes gain from their readings? What if there *were* life on another planet? What implications do students see for such an eventuality? What does the concept "incest" mean to the students?

In all subject areas, from the highly charged plays of Sophocles to new discoveries in science, students accommodate to their own conceptual systems the things they are told, what they hear, and what they perceive (Abelson, 1981). These accommodations form the essence of meaning. As Novak and Gowin (1984) point out, meaningful learning enables the student "to tie things together and connect part to part to whole." It is "meaning" in this sense that allows the student "to exercise the powers of inference, self-understanding, and thoughtful action" (p. 110).

The student's process of accommodating new information to his or her own conceptual system, however, is fraught with pitfalls. A student may distort new learning to make it fit previously learned material. In this case, the accommodation may, in the long run, hinder future learning. Or the student may not see how the new content relates to *any* previous learning and may treat it as discrete material to be learnt by rote, tested, and forgotten. On the other hand, a student may see how the new learning relates to previous learning and resolves questions he or she has harbored for some time.

To ensure that students will accommodate new learning in positive ways, teachers can use debriefing.

Debriefing Strategies

I am sensitive about using a borrowed term to describe techniques teachers have used for years to advance the understanding of their students (Pearson and Smith 1985), but in this case, "debriefing" seems especially apt and particularly graphic. A term originally used to describe the process of working with spies or astronauts after completing a mission, it is based on the belief that persons involved in such complex operations or experiences cannot remember all there is to tell, that they have impressions that are difficult to verbalize, and that they may forget or distort what they have seen or heard unless their accounts are thoroughly reviewed and shared. In schools, debriefing is a process of helping students reflect on their learning experiences, attach personal meanings to them, and deepen their understandings. Consider the following examples.

After a field trip to a farm, the teacher asks students to draw up a picture of the most important thing they saw on the visit. The pictures are collected and displayed before the class. The various representations were grouped, discussed, and shared.

At the end of a unit on the Civil War, the teacher involves students in a culminating experience, that of preparing a simulated "60 Minutes" documentary on the war, designed to draw together and to integrate what the students have learned during the six-week period.

After carrying out a scientific experiment, students are asked to prepare laboratory reports, to identify their assumptions, their findings, and their conclusions from the experiment.

These activities enable students to share what they learned through an experience, summarize what the experience meant to them, and to provide the teacher with the opportunity to review what students did not understand very well.

Debriefing: A More Precise View

Debriefing is not the same as summarizing. Summarizing is often a task performed by others, frequently the teacher, who gives the gist of what happened or what was covered. It

might serve as a debriefing process for the person giving the summary. But listening to a summary does not give a student the opportunity to make sense of what has been taught or experienced, to operate on experience by organizing it, to emphasize some elements and not others, or to relate the experience to other events or ideas.

Preparing for a test is probably not a debriefing process either, since cramming is often a process that students do on the teacher's terms - working to understand the course as the instructor sees it. While insights and new meanings might well be a product of a cram session, it is not a likely outcome - especially if the test is an objective, short-answer examination. If the exam, on the other hand, asks students to share their own understandings, to identify the strengths or weaknesses in some narrative, or to reorganize what has been learned into a comprehensive whole, then debriefing is more likely to occur.

Debriefing gives students relatively free rein to organize, compare, class-

Debriefing gives students relatively free rein to organize, compare, classify, evaluate, summarize, or analyze an experience.

ify, evaluate, summarize, or analyze an experience. The product of the debriefing process is an articulated sense of "meaning". It is through this process of constructing personal meanings that students reveal their misunderstandings, oversimplifications, and personal theories.

Teachers can use several activities to help students attach meanings to learning experiences.

Writing logs/diaries can document students' reactions to events and are particularly useful if the entries interpret what has happened.

Writing a precis, a concise abridgement, asks students to identify the gist of an experience, reading, or observation. It requires students to prioritize their own impressions and become more articulate about the meanings they have attributed to experiences.

Naming themes asks students to think of the personal lesson that was learned, message that was conveyed, or thrust of a reading passage or experience. Again, the task here is not to be too literal, but to abstract meaning from an experience. The question "What does it (the assignment, topic, experience) remind you of?" encourages students to find themes or gists.

Imagininng requires students to imagine "what if", to pretend, to create alternative endings, to surmise about alternatives. Each such effort, however, should be disciplined at least in part by the student's own interpretations of the experience.

Evaluating asks students to rate or rank an experience. Students can be invited to share or defend the bases of their evaluations.

Role-playing gives students an opportunity to act out their understanding of processes, or a literary character's personality, or new problematic situations. Again, not just any behavior on the part of the student is on target. Students need to try to use their interpretations of the elements of the experience.

Drawing is a nonverbal assignment that can help students identify major themes or issues. Since writing narratives can narrow the scope of shared meanings, the assignment to draw a picture often helps students identify salient meanings derived from experience.

... recent meta-analyses demonstrate that intermittent summarizing or recalling increases students' ability to recall what they have learned.

Comparing requires students to relate reading a book or a poem or taking a field trip to another similar experience. This encourages them to identify features of each they consider relevant.

Concept mapping is another nonverbal approach. It asks students to visualize and draw the relationships between concepts with a series of links or chains.

Outcomes of Debriefing

The recent work in cognitive psychology and cooperative learning supports the claim that debriefing enhances learning. Yager, Johnson and Johnson (1985) assert that recent meta-analyses demonstrate that intermittent summarizing or recalling increase students' ability to remember what they have learned. They further claim that "cognitive rehearsal" - the process that occurs when students talk about what they have learned - is "one of the most promising of the mediating variables" examined to account for the success of cooperative learning (p. 61).

By teaching students strategies to help them recall and reconstruct what they have learned, teachers can instruct not only for facts, but for understanding.

References

Abelson, R.P. "Psychological Status of the Script Concept." *American Psychologist* 36, 7 (1981): 715-729.

Novak, J.D. and D.B. Gowin. *Learning How to Learn*. New York: Cambridge University Press, 1984.

Pearson, M., and D. Smith. "Debriefing in Experienced-Based Learning." In *Reflection: Turning Experience into Learning*, edited by D. Boud, R. Keogh, and D. Walker. New York: Nichols Publishing Company, 1985.

Yager, S., D.W. Johnson, and R.T. Johnson. "Oral Discussion, Group-to-Individual Transfer, and Achievement in Cooperative Learning Groups." *Journal of Educational Psychology* 77, 1(1985): 60-66.

James Rath is Professor of Education, University of Illinois, Center for Instructional Research and Curriculum Evaluation, 270 Education Bldg., 1310 S. Sixth St., Champaign, IL. 61820.

Reprinted with permission from Educational Leadership (Oct 87)

Building Bridges: Strategies for Increasing Students' Word Power and Reading Comprehension

Good teachers will always be devising innovative ways to facilitate their pupils' learning. The most basic learning task, as well as the essential one that pupils have to master in order to become effective learners is reading - appropriately called "The First R". Because educators regard reading as of utmost importance, it is no wonder that the skill has received so much attention and generated such a large amount of research and controversy. The fact that there are so many conflicting points of view regarding how the reading act occurs and how reading is learned testifies to its complexity as a skill necessary for academic success.

What is Reading Comprehension?

Perhaps the most striking generalization that emerges from the literature is that research in reading has been rapidly shifting since 1965 from an atheoretical to a theoretical base with concomitant interest in developing models of reading and more adequately definitions of it. The implications of this shift for the teacher is that a clearer and better perception of the reading process and how it can be taught, are making the visions even more complex. The main arguments about how reading should be taught have been repeated over and over again as the decades pass, but still the problems remain. Psychologists, linguists and reading specialists believe that if we could understand reading we would understand the mysteries of the human mind.

For many years, reading specialists have attempted to define reading.

There is general consensus that reading involves the ability to construct meaning from printed symbols. Research in the past twenty years has enabled us to refine the definition further. A comprehensive definition of the reading process based on this research was developed by the state of Michigan in the United States (Wixon, Peters, Weber & Reober, 1987) and it goes like this:

Reading is the process of constructing meaning through the dynamic interaction among the reader, the text and the context of the reading situation.

Reading comprehension according to psychologists, linguists and reading specialists is "a process subject to the same constraints as human memory and problem-solving processes...as a reflection of the inner workings of the human mind" (Pearson and Johnson, 1978). Reading research seems to be shifting from an emphasis on trying to understand how a reader comprehends when he reads to trying to find ways of helping students understand what they read (National Institute of Education, 1976).

What is comprehension? In a word - understanding. Kintsch (1976) views the act of comprehension "as the decoding of texts into text bases". He goes further to say that "texts have no meaning in so far as they are derived from a meaningful message in one mind and produce a meaningful communication in another mind". Reading comprehension according to Pearson and Johnson (1978) involves "language, motivation, perception, concept development, the whole of ex-

perience itself". Olson (1977) defines comprehension thus:

Comprehension...may be represented by a set of procedures that involve selectively applying one's personal experiences or knowledge of the world to the surface structure of sentences to yield meaning. In so doing, one elaborates, assimilates and perhaps 'imagines' the sentence.

Another way of looking at comprehension may be to view comprehension as "building bridges between the new and the known" (Pearson and Johnson, 1978). By this metaphor is implied that comprehension involves drawing inferences and interpreting statements according to our perception of what is said or written on the basis of our past experiences. In other words, our ability to comprehend text is highly dependent upon our background knowledge (Richek, List & Lerner, 1989). When we read a text, our experiences, vocabulary, grammar and phonology permit interrelated impressions, or to use Shank's term (1975) "scripts", to surface to our minds. So in comprehension, we (1) process information, (2) match it against the prototypical script for events, and (3) assimilate or accommodate what is new in the text with what we already know. Each reading passage or sentence is considered to have certain implications that stretch beyond the surface representation. This is one of the reasons why Kenneth Goodman (1967) has called reading "a psycholinguistic guessing game". The bridges or links that the reader constructs originate mainly from what the reader deduces

from the evidence in the text and what the text says explicitly. The "bridge" metaphor, then, offers a rich store of implications for the teaching of reading.

Improving Reading Comprehension

In this paper, two ways of developing a meaning vocabulary which teachers can use to help their pupils improve comprehension will be discussed. These approaches are known as *semantic mapping* and *semantic feature analysis*.

Human memory contains an enormous variety of concepts that can be retrieved and used at will. People have concepts of many things and most of the time, their concepts have labels. In addition, large amounts of information associated with any given concept can be produced on demand. First, we must have a way to represent these concepts in a memory system such as that of Lindsay and Norman's (1972) or of Pearson and Johnson's (1978).

At this point I would like you to take part in a little experiment. Explain what the word "dog" means. What kinds of information do you produce when describing its meaning? A typical explanation goes something like this:

DOG: A dog is any of a large group of domesticated animal belonging to the same family as the fox, wolf, jackal. (*Webster's New World Dictionary*)

Similarly, what do the following words such as "car", "school", "rose"

mean?

CAR: A car is any vehicle on wheels such as an automobile.

SCHOOL: A school is a place or institution for teaching and learning such as a public school, a dancing school, college or university.

ROSE: A rose is any of a genus of shrubs with prickly stems and five-parted, usually fragrant flowers of red, pink, white, yellow.

These examples show us that the definition of a word consists of other words. Typically, a definition starts off by saying, "Concept A is really something else - concept B"; a car is a vehicle, a school is a place or institution and a rose is a shrub. Then, it goes on to specify the restrictions on the concept. Cars have wheels. A school is where teaching and learning takes place. The unique thing about a rose is that it has a prickly stem and fragrant flowers.

Another way of describing a concept is to give an example. If you were explaining what the word "car" means to someone who does not understand English, you will probably point out some examples, such as a Volvo.

An important part of the meaning or understanding of a concept must be embedded in its relationships to other concepts in the memory. On examining the way definitions of concepts are given, we find that only a small number of relationships predominate - the *class* to which concepts belong (a car is a vehicle), the *properties* which tend to make that concept unique or stand

out (has wheels), and *examples* of the concept (a Volvo). A standard definition can be summarized schematically thus:

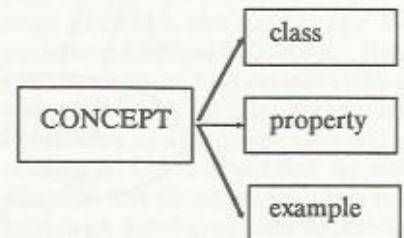


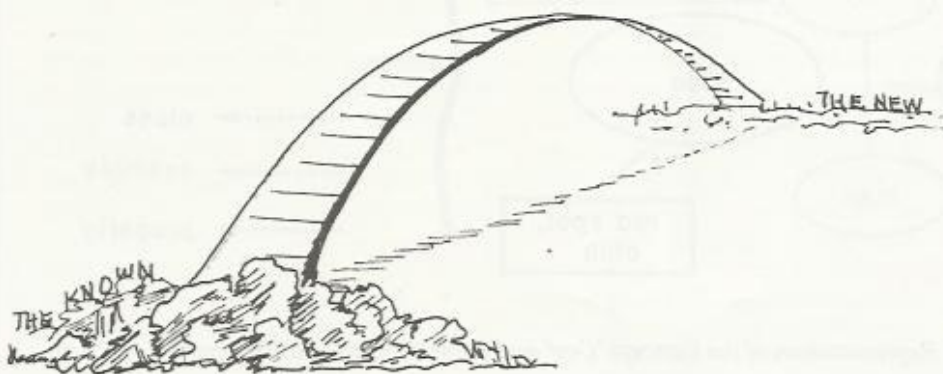
Fig 1. Definition of a Concept

Semantic Mapping

Collins and Quillan (1969), Lindsay and Norman (1972) and Pearson and Johnson (1978) portrayed this whole set of relationships graphically. The basic idea in Collins and Quillan's model is that words are organized in memory somewhat as in a thesaurus, with words of similar meaning located near one another with a hierarchical principle encompassing levels of abstractness or generality. Lindsay and Norman's model used definitions of concepts such as the examples that were mentioned earlier (car, school, rose) to map out the concepts and relations. I feel most comfortable with Pearson and Johnson's model and have used it extensively myself to extend and develop children's vocabulary. They called this semantic network a "semantic map", which consists of nodes and links between nodes (see Figure 2). Nodes represent concepts and links represent relations between concepts.

In the example of an incomplete semantic map of the concept "dog" as given by Pearson and Johnson (1978, pp. 27), the semantic map will resemble English more if a few of the labels are changed. For example, the *class* and *example* links (dotted and broken lines) can be replaced with a link commonly called "isa" (is, a). So, we can say "a dog isa pet", or "a dog isa animal". Also, we can replace the property link with "has" or "is" or "does". An example of each can be "a dog has fur", "a dog is loyal", "a dog does bark".

That is all very well at the word level, but, in most comprehension tasks, students have to deal with longer units of



Building Bridges

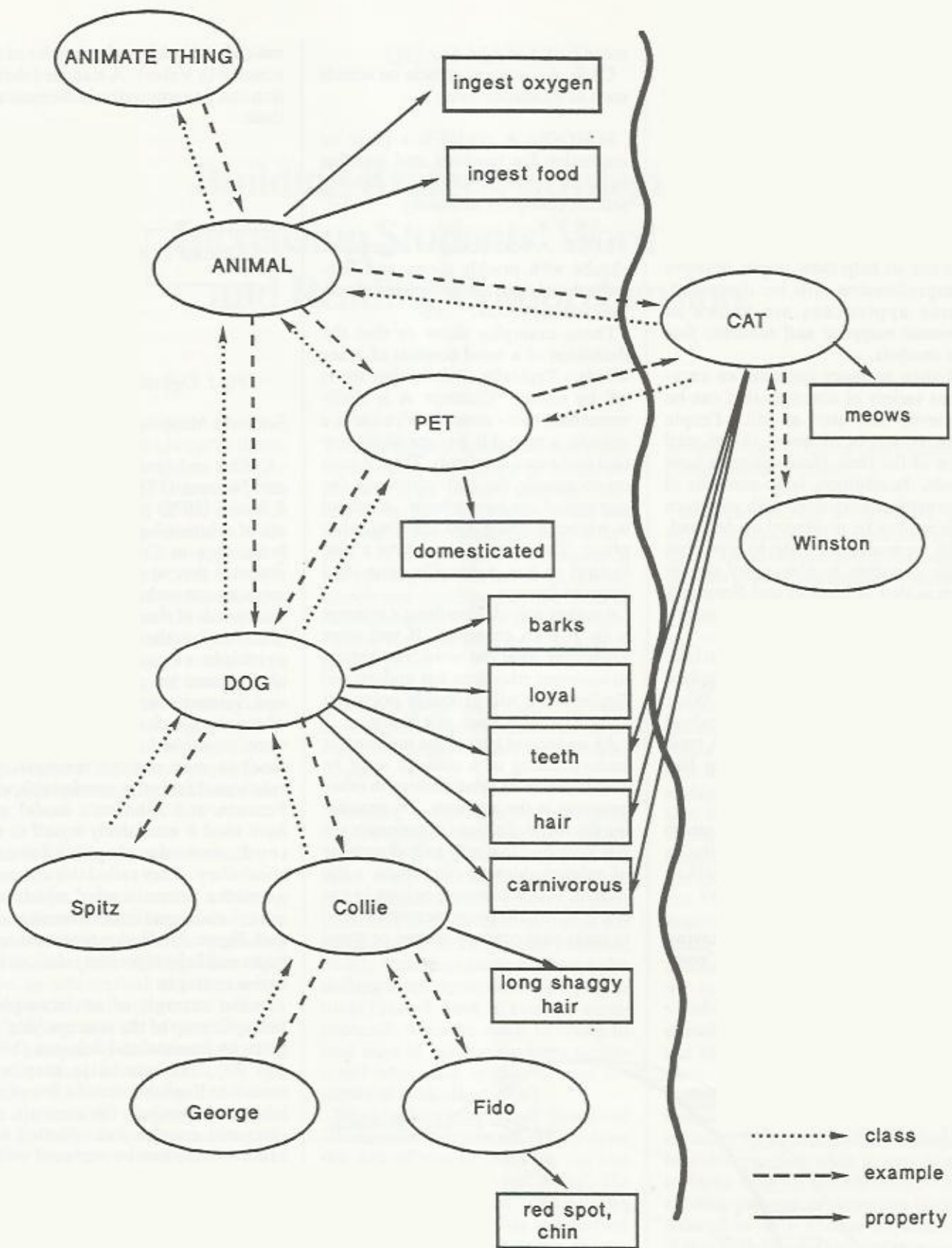


Fig 2. An Incomplete Semantic Network Representation of the Concept 'Dog' and Some of its Related Concepts

(Source: Pearson & Johnson, 1978)

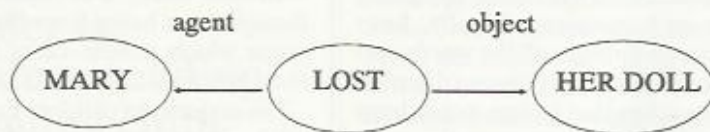


Fig 3. Relations in a Semantic Network for a Simple Sentence

discourse such as, sentences and paragraphs. Lindsay and Norman (1972) have utilized Fillmore's (1968) case grammar to expand the number and kind of relations that can exist in a semantic network. The first thing to do here is to identify the basic *action*. Secondly, identify the *actors*, (1) what is the agent who caused the action to take place, (2) who or what is the object who directly affected or received the action. An example follows:

SENTENCE: Mary lost her doll.

Action: lost
Agent: Mary
Object: her doll

The action, then, becomes the focal point around which all other concepts in the event revolves. Schematically, the sentence can be represented as in

Fig. 3.

How are complex sentences expressed schematically? Fig 4 is an example used by Pearson and Johnson (1978) of a semantic map of the complex sentence (Fig. 4).

Because Samson was bewitched by Delilah, he cut his hair and lost his great strength.

Semantic maps like the one given in Figure 2 can be used with any word given in any language. Teachers can use this strategy in classroom instruction to make students aware of the vast store of knowledge they possess about most concepts. I have used semantic mapping extensively and effectively with children, especially those who come to school with limited vocabularies in English. Although they may be disadvantaged in terms of

their knowledge of English, many of these children are rich in experience and knowledge of their mother tongue. Ordinarily with these children, I would capitalize on what they already know and teach them to read through the Language Experience Approach (LEA). However, sometimes with certain children who need first of all to learn to express themselves in a language they will be reading in, I have found that the most effective way to accomplish this is to help them develop a richer vocabulary through semantic mapping. Using this method also provides me with insights into what students already know about a concept about to be taught, so that I can then plan to teach what the students do not already know and provide the "bridge" between what is new and what is known. Hence, semantic mapping is a valuable and informal diagnostic tool which teachers can use to advantage.

Semantic Feature Analysis

Another useful strategy to use to teach comprehension at the word level is known as semantic feature analysis. This involves identifying an overall category for a group of words, enumerating the related words, specifying features that these words share to show how they fit into the

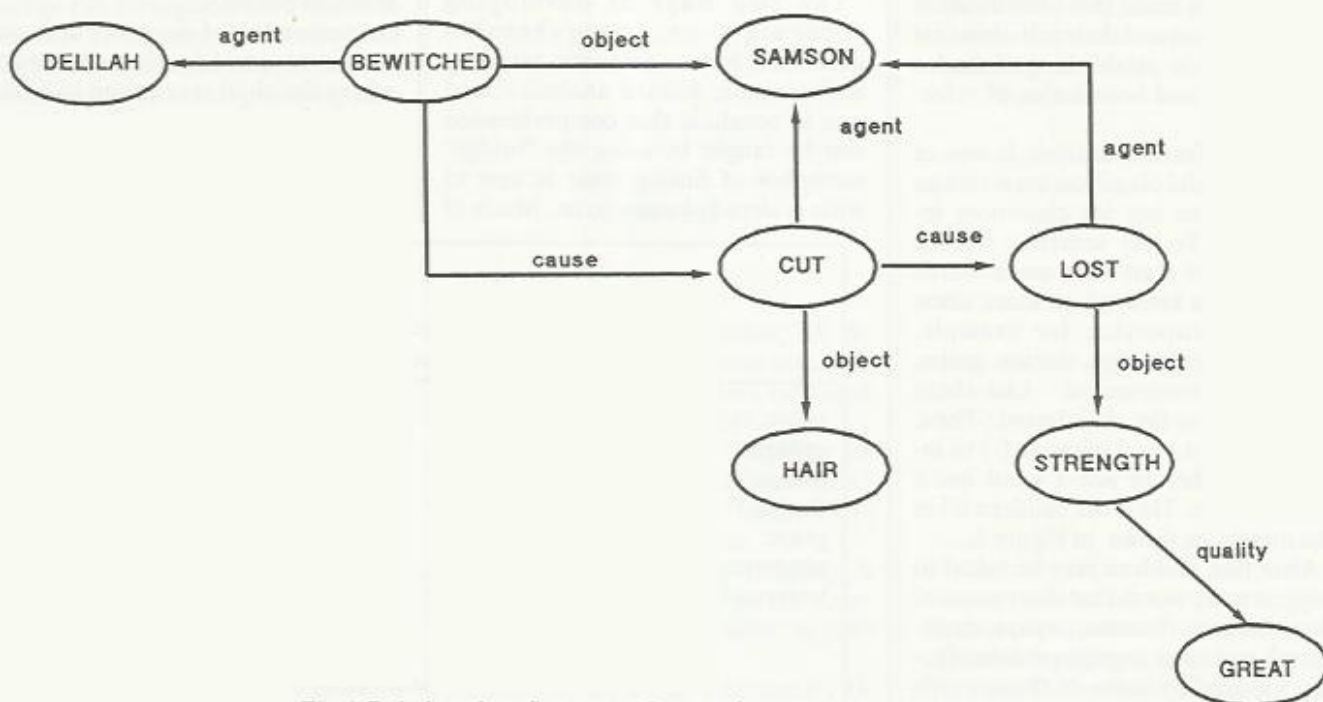


Fig 4. Relations in a Semantic Network for a Complex Sentence

Comprehension involves drawing inferences and interpreting statements according to our perception of what is said or written ...

overall class. The "bridge" metaphor and semantic feature analysis are also related in the sense that identification of word classes and their sub-elements can lead to the establishing of shades of meaning and boundaries of references.

Semantic feature analysis is one of the most useful classification activities a teacher can use for classroom instruction. To use semantic feature analysis, first start with some words that children know which share some common properties, for example, apple, orange, mango, durian, grape, rambutan, watermelon. List these fruit words on the chalkboard. Then, use pluses (+) and minuses (-) to indicate whether or not a word has a given feature. Have the children fill in the matrix, as shown in Figure 5.

After this, children may be asked to suggest more words that share some of these features (banana, papaya, strawberry) and then to suggest more features shared by some of these words (rough skin, smooth skin, local, im-

ported). Children will then complete the remainder of the matrix by adding pluses and minuses. Finally, have children go through all the words and their features so that they can discover for themselves that no two words have identical meanings as even the most synonymous pairs or clusters of words will have different patterns once enough semantic features are listed. Semantic feature analysis is thus a worthwhile exercise for teachers to use with children in order that they may learn that two words can only be "similar" and not "the same as". They will realize that the English language is a parsimonious language as no two words are exactly alike. This helps children develop precise thinking which in turn helps comprehension as children understand the exact meanings of words.

Semantic feature analysis can be constructed with any category of words. Teachers are advised to start off with concrete categories that are within the experience of pupils and later progress to more abstract ideas. As children improve in reading, teachers can substitute a scale of 0 to 10, similar to that in a Likert Scale instead of using pluses and minuses so that even greater precision is arrived at.

Summary and Conclusion

The two ways of developing vocabulary or comprehension described here - semantic mapping and semantic feature analysis - lead one to conclude that comprehension can be taught by using the "bridge" metaphor of linking what is new to what is already known to us. Much of

our knowledge of "words", together with their linkages or relations can be thought of as being stored in semantic maps which people carry around in their heads.

The majority of children enter school with rich listening and speaking vocabularies. These words they have represent the experiences they have encountered since birth which is different for each child. Hence, no two children can be expected to develop in the same way and possess the same kind of concepts to represent the world they have experienced. Most children are proficient language users by the time they reach school age. When they are allowed to bring all this experience to learning to read, gaining control over the process is relatively easy and quick for most (Phinney, 1988).

The implications of this for classroom instruction is that in order to introduce reading to a young child successfully, the teacher should match the language of the book to the child's language, thus enabling the possibility of the child's intelligent use of context. If reading materials are within the familiar sentence patterns to those he uses in speech and writing, he will be able to comprehend them much more readily. In order to ensure that this parallelism can be accomplished, reading teachers should utilize the child's stories and those of his peers as much as possible.

Another way of using words in context is to provide cloze procedure where the child is required to fill in a sensible word. A child's selections and his reasons for the selection should be discussed. In this way, the

	one seed	few seeds	many seeds	single	bunch	sweet	sour
apple		+		+		+	
orange		+		+		+	+
mango	+			+		+	
durian			+	+		+	
grape		+			+	+	+
rambutan	+				+	+	
watermelon			+	+		+	

Fig 5. Semantic Feature Analysis of Fruits

In order to introduce reading to a young child successfully, the teacher should match the language of the book to the child's language, thus enabling the possibility of the child's intelligent use of context

teacher can strengthen his abilities to use the semantic, syntactic and graphic clues to word recognition and meaning. Whenever possible, new words to be learned should be presented as concretely as possible—may be in pairs or clusters in which a relationship can be recognized. As the child's vocabulary develops, he should be given practice in arranging words in some sort of hierarchical order (for example, synonyms, opposites, actions, etc.). Classroom exercises may consist of practices in shifting from one category to another such as, recognizing that a father may also be a brother, son, cousin, uncle. This type of direct vocabulary teaching is strongly recommended to help a child develop word power.

To help students increase their background knowledge, there are several steps teachers can take. Teachers can help students build background before they read. The first part of the

reading lesson is the most crucial and often the most neglected. Teachers should ask students what they know about the subject of a text, teach important concepts (for example, through semantic mapping) that students are missing and relate subject to the material the students are reading. Teachers should also impart their own personal knowledge to students. A teacher's rich background knowledge is a repository of extensive cultural information, a valuable resource that should be shared with students.

In summary, let me reiterate a few points. Semantic mapping involves identifying words that represent concepts and those that show relations between concepts. Through semantic mapping, we use nodes to represent concepts and links to identify the relations between concepts. Semantic feature analysis involves identifying an overall category for a group of words, enumerating the related words, specifying the features that they share to show how they fit the overall class. In the hands of innovative teachers, both these strategies can prove to be powerful ways of developing vocabulary to aid in children's reading comprehension.

References

- Collins, A. M. & Quillan, M. R. (1969). Retrieval time from semantic memory. *Journal of Verbal Learning & Verbal Behavior*, 8, 240-247.
- Fillmore, C. J. (1968). The Case for Case. In E. Back & R.G. Harms (eds.) *Universals in Linguistic Theory*. N.Y.: Holt, Rinehart & Winston.
- Goodman, K. S. (1967). Reading: A psycholinguistic guessing game. *Journal of the Reading Specialist*, 6, 126-135.
- Johnson, D. D. & Pearson, P. D. (1978). *Teaching Reading Vocabulary*.

N.Y.: Holt, Rinehart & Winston.

Kintsch, Walter (1976). Memory for Prose. In Charles N. Cofer (ed.) *The Structure of Human Memory*. San Francisco: W. H. Freedman & Co.

Lindsay, P. H. & Norman, D. A. (1972). *Human Information Processing: An Introduction to Psychology*. N.Y. & London: Academic Press.

National Institute of Education (1976). *Request for Proposal a National Center for the Study of Reading*. Washington, D.C.: Dept of Health, Education & Welfare.

Oldson, D. R. (1977). From utterance to text: The bias of language in speech and writing. *Harvard Educational Review*, 47, 257-281.

Pearson, P. D. & Johnson, D. D. (1978). *Teaching Reading Comprehension*. N.Y.: Holt, Rinehart & Winston.

Phinney, M. Y. (1988). *Reading with the Troubled Reader*. Ontario, Canada: Scholastic.

Richek, M. A., List, L. K. & Lerner, J. W. (1989). *Reading Problems: Assessment & Teaching Strategies*. 2nd Ed. Englewood Cliffs, N. J: Prentice Hall.

Wixon, K., Peters, C., Weber, E. & Roeber, E. (1987). New directions in statewide reading assessment. *The Reading Teacher*, 40, 749-755.

Quah May Ling is a lecturer at the Nanyang Technological Institute, Singapore.

Integrating Instructional Programs Through Dimensions of Learning

The "Dimensions" framework - based on general principles of how learning occurs - can be used to plan instruction, coordinate the use of various programs, and select and plan staff development activities.

Today's teachers have available an abundance of practices that can help them do a better job. Developers have designed and tested programs for maintaining discipline, motivating students, applying learning theory, encouraging cooperative behavior, teaching thinking skills, and so on. Unfortunately, many of these programs are seen as independent of one another, so they become bandwagons, each an isolated movement that lasts until the next one comes along. A teacher tries a little mastery learning for a while, then teacher expectations, then cooperative learning, then teaching thinking, and so on.

What is needed is a framework to integrate these programs; a tool that will help educators see how the various practices relate to one another. With such a framework, teachers will find it easier to blend several different programs, and administrators will be able to select and present various staff development efforts as a unified whole rather than as separate entities.

As we have worked with classroom teachers over the last two years to im-

plement ASCD's *Dimensions of Thinking* (Marzano et al. 1988), we have begun to see how the types of thinking discussed in that publication can be recast into such a framework.

Use of the framework will help teachers blend several different programs, and administrators select and present various staff development efforts as a unified whole rather than as separate entities.

A Common Thread: Teacher Behavior

A thread running through most staff development programs is that teachers' actions are expected to produce certain types of thinking in students. If a teacher increases her physical proximity to a student who is misbehaving, the student may realize that he is breaking a classroom rule and correct his behavior; when a teacher asks a recall question, it cues students to search their memories for the requested piece of information.

This suggests that if we can identify the main types of student cognitions needed for various learning tasks, we can use the resulting scheme to classify the instructional practices featured in the leading inservice programs.

Some Principles of Learning

Unfortunately, student thinking doesn't occur in neat, easily identifiable categories. To guide our effort, therefore, we have identified four principles of human learning gleaned from current research and theory.

Principle #1: Attitudes and Perceptions Affect Learning

Recent research in motivation (e.g. Harter 1982, McCombs 1986, Weiner 1972, 1983) indicates that a person almost always approaches a task with a set of accompanying attitudes and perceptions that greatly influence performance. When a student sits down to read a chapter in a text for a course she is studying, she approaches the reading task with certain attitudes about the value of the course, the value of the textbook and her knowledge and ability relative to the content being studied. Some attitudes are conducive to learning; others work against it. If the student believes that the course is quite valuable because it will help her attain a personal goal, her attitude will positively affect her learning. Conversely, if she can't see the value of the course, her attitude will negatively affect her learning.

Principle #2: Learning Involves Acquisition of Two Kinds of Information

Knowledge can be divided into two basic types: declarative and procedural (Paris and Lindauer 1982, Paris et al. 1983). *Declarative knowledge* is concerned with who, what, where, and when: for example, information about who was involved in Watergate, what occurred, and where and when it occurred. Researchers commonly subdivided declarative knowledge into (in order of specificity) facts, time sequences, causal networks, problems/solutions, episodes, principles, and concepts.

Procedural knowledge is knowledge of "how to", such as how to write a research paper. Sometimes the components of procedural knowledge are represented as steps that must be applied in a particular sequence; for example, the algorithm for doing long division. Others are much more loosely ordered, for example, the procedure for reading a bar graph.

Content in any field can be subdivided into these two main types. A course in geography might include concepts and principles (declarative knowledge) about the distribution of land, along with processes (procedural knowledge) such as how to read a contour map.

The dimensions are most useful as a kind of metaphor to guide instruction.

Principle #3: Once Acquired, Knowledge Undergoes Changes

Much recent research sheds light on the specific cognitive operations involved in the initial acquisition of information (for a review, see Anderson 1983, Estes 1982). A key cognitive operation is *activating old knowledge* and using it to make sense of new information. For example, while watching a documentary on sharks, you use your previous knowledge about sharks to help you make sense of the new information.

Another cognitive operation used when initially learning new information is *organizing the information* in such a way as to associate it and make linkages with existing knowledge in long-term memory. This not only helps your understanding of the new information, but it also makes the information more retrievable for use at a later date.

But knowledge stored in the mind is not static. Over time it changes, sometimes quite unexpectedly. Rumelhart and Norman (1981) have identified three types of knowledge change: accretion, tuning, and restructuring. *Accretion* refers to changes in knowledge due to the gradual accumulation of information. *Tuning* refers to the creation of generalizations about existing information. (It is a much more global and radical form of change than accretion.) *Restructuring* is the most global and most radical form of change, involving the creation of entirely new structures either to augment or to replace the old structures.

Common to all theories of knowledge change is the idea that to change an existing knowledge structure, the learner must mentally

process the information in new and unusual ways (for a review, see Vosniadou and Brewer 1987). For example, when a student compares two or more concepts in detail, even if he knows them fairly well, he will probably "learn" something new.

Perhaps the most change-producing cognitive function is the *actual use of knowledge* in meaningful ways. It is one thing to listen to or read instructions for how to use a computer word-processing program but another thing entirely to actually use the program to prepare a manuscript. Only through actual use do most people begin to understand how the system works, as they solve the frustrating problems they invariably encounter.

In summary, the continuum of knowledge development involves cognitive operations that the learner uses to *acquire* information, other operations that the learner uses to *refine* the information, and still other operations that the learner can employ to *make use of* the information in meaningful ways.

Principle #4: Effective Learners Exhibit Dispositions Associated with Critical, Creative, and Self-Regulated Thinking.

Based in part on studies of capable thinkers, scholars have identified various qualities of desirable thinking, often referred to as critical and creative thinking. Perkins (1984), Ennis (1985), Glatthorn and Baron (1985), Lipman (1988), and Costa (1985), for example, cite numerous characteristics of "good" thinking, including:

- being aware of one's own thinking at any point in time
- seeking accuracy in what one does
- operating at the edge rather than the center of one's ability.

Operations such as these are sometimes referred to as dispositions, because a person who has formed desirable habits of mind is "disposed" to behave in these ways. Dispositions are not unconscious; good thinkers often strive quite deliberately to meet such standards, asking themselves, "Have I considered other points of view fairly?" "Have I examined enough

alternatives?" These habits of mind, while not innate, can be internalized with practice and this can become part of one's personality.

Principles of Learning into Dimensions of Learning

The four principles of learning can be used to identify types of student thought that need to occur for learning to take place. We might call them "Dimensions of Learning": types of cognition that facilitate learning. Our portrayal of these dimensions will imply a general pattern or sequence (first one type of thinking occurs, then another), but that should not be taken literally; the dimensions are most useful as a kind of metaphor to guide instruction. As we will demonstrate, they can also be used to help understand how various instructional programs are similar and different.

The five dimensions that spring from the principles of learning are: (1) thinking needed to develop positive attitudes toward learning, (2) thinking needed to initially acquire and integrate knowledge, (3) thinking needed to extend and refine

An effective classroom climate is practically invisible, but it doesn't happen by chance; it is crafted by the artful teacher in subtle but intentional ways.

knowledge, (4) thinking needed to make meaningful use of knowledge, and (5) thinking needed to develop desirable habits of mind. Although not a direct translation, these five dimensions are adapted from the ASCD-sponsored framework, *Dimensions of Thinking*, (Marzano et al. 1988). Here is a brief explanation of each dimension.

Dimension 1: Thinking Needed to Develop a Positive Attitude Toward Learning

As summarized in the first principle of learning, an important factor in any instructional situation is the student's attitude. We have identified three categories of attitudes and perceptions especially relevant to learning: attitudes and perceptions about (1) self and climate, (2) self and others, and (3) self and the task.

Attitudes about self and climate include the learner's perceptions about safety, comfort, and order in the learning situation. One of the learner's first concerns is often his or her own safety and comfort. This point has been emphasized by learning theorists such as Maslow (1968) and Combs (1982), and reinforced by findings of the school climate studies of the 1970s (Denham and Lieberman 1980).

Another category of attitudes affecting learning is *attitudes about self and others*. Students tend not to learn well unless they feel accepted by the teacher and the other students. The research on teacher expectations (Good 1982, Good and Brophy 1972) has shown the importance of student perceptions of teacher acceptance, and research on cooperative learning (Johnson et al. 1984) has shown the importance of student perceptions of acceptance by their peers.

The final area of attitudes affecting learning has to do with *self and task*. The learner must believe that the task has value, that she has a fairly clear understanding of what is required, and that she has the ability to complete it; otherwise the task becomes a threat to her sense of competence (Covington 1983).

To provide for this dimension, teachers need to be able to establish and maintain an appropriate environment for learning. For example, a teacher might reinforce effective at-

titudes about self and climate by occasionally greeting students at the door or by arranging the physical aspects of the classroom in such a way as to accommodate different learning styles. A teacher might reinforce effective attitudes about self and others by making sure he provides equal opportunities for students to answer questions (so that students have a sense of acceptance by the teacher) and by using cooperative learning (so that students develop a sense of community and peer support). A teacher might establish effective attitudes about self and task by structuring tasks for high success, using scaffolding with students who are having difficulty, and communicating to students a sense of confidence in their ability to accomplish classroom tasks.

An effective classroom climate is practically invisible, but it doesn't happen by chance; it is crafted by the artful teacher in subtle but intentional ways.

Dimension 2: Thinking Needed to Acquire and Integrate Knowledge

The second principle of learning discussed earlier makes a distinction between two kinds of knowledge important to any content area: declarative and procedural. The third principle of learning indicates that a learner changes knowledge over time rather than simply retaining it in the form in which it was first acquired. Putting these two principles together, the second dimension of learning deals with the acquisition and integration of both declarative and procedural knowledge. The mental processes involved in this second dimension can be subdivided into three types (1) constructing meaning, (2) organizing content, and (3) storing or practicing.

Acquiring Declarative Knowledge

Constructing meaning refers to using what is already known to make sense of what is to be learned. Research, particularly research in reading comprehension, has established numerous strategies that can be used to help students construct declarative knowledge. For example, in K-W-L (Ogle 1986) the learner begins by identifying what she knows about the topic (K = what I already *know*), and what she would like to know (W =

what I *want* to know). She then reads (listens to, observes) the information and determines what she has learned (L = what I *learned*). The strategy involves the learner in actively constructing meaning for new information.

Organizing declarative knowledge involves making distinctions among the different types of important information taught in a lesson (e.g. facts, time sequences, causal networks, problem/solutions, episodes, concepts, principles). Making these distinctions is the key to effective learning of declarative information. Specifically, since much of the declarative information presented to students orally and in writing can be organized in a variety of ways, students need to be able to organize the content in a way consistent with the teacher's preferred method of organization. If a teacher does not explain his preferred method of organization before presenting information, the instruction will lack focus and will impose on the learner the burden of trying to figure out how to organize it.

Finally, *storing information* involves representing it in long-term memory in a way that makes it easily accessible

at later times. Operationally, this involves use of techniques such as verbal rehearsal, imagery, mnemonics, and so on.

Acquiring Procedural Knowledge

Two of the processes needed to acquire procedural knowledge are similar to those involved in acquiring declarative knowledge. For example, when first learning how to read a particular type of graph, a learner might help construct meaning by activating what she knows about reading other types of charts or graphs, thus creating an initial model of the processes involved. Operationally this might involve making a flowchart showing steps in the procedure.

Storage, however, is different for the two types of knowledge. Whereas declarative knowledge needs to be stored for easy retrieval, procedural knowledge must be practiced to the level of automaticity. Operationally, this means that the learner needs to practice the procedure long enough that he can perform it with relatively little effort or thought.

The second dimension of learning, then, is thinking that helps the learner initially acquire and integrate both

declarative and procedural information. Cognitively, this requires the construction of meaning, the organization of information, and either storage or practice, depending on whether the information is declarative or procedural.

Dimension 3: Thinking Needed to Extend and Refine Knowledge

According to the third principle of learning, knowledge continues to undergo substantive change after it has been acquired. One might say that once it has been acquired, knowledge is then available for extension and refinement, which comes about through processing the information in new and unusual ways. We have identified eight such ways (fig. 1).

Each of the cognitive operations listed in Figure 1 can be used to engage the learner in such a way as to change his or her knowledge of the content. In a social studies class, for example, students might compare different forms of government (democracy and dictatorship) to discover new distinctions between them. Similarly, making deductions, such as anticipating future events or conditions based on current information, can help students better understand the information on which the deductions are made. In a science class, for example, students might make deductions about whales based on known principles about mammals to refine and extend their knowledge about mammals and whales.

We might point out that the cognitive operations listed in Figure 1 may also be used when initially acquiring knowledge. For example, when first learning about types of governments, students may engage to some degree in comparison, induction, deduction, and so on. At this stage, however, most such activity will be automatic and relative unconscious. To extend and refine knowledge, these operations are used consciously, rigorously, and with greater complexity. For example, when students first learn about democracies and republics, they might think casually about similarities and differences between the two. To extend and refine these concepts, however, they would be asked to list these similarities and differences, perhaps using some type of graphic or matrix

Fig 1. Extending and Refining Operations

Comparing:	Identifying and articulating similarities and differences between bodies of information relative to their specific attributes.
Classifying:	Grouping items into definable categories on the basis of their attributes.
Inducing:	Inferring unknown generalizations or principles from observation or analysis.
Deducing:	Inferring unknown consequences and necessary conditions from given principles and generalizations.
Analyzing Errors:	Identifying and articulating errors in one's own thinking or in that of others.
Constructing Support:	Constructing a system of support or proof for an assertion.
Abstracting:	Identifying and articulating the underlying theme or general pattern of information.
Analyzing Value::	Identifying and articulating personal value and general value of information.

Fig 2. Processes Involving the Meaningful Use of Knowledge

Oral Discourse:	The act of discussing a topic using specified convention that add clarity to and provide new insights into the topic of discussion.
Composing:	The act of creating a new product using known information.
Problem Solving:	The act of attaining a content-related goal by overcoming some obstacle.
Decision Making:	The act of selecting among seemingly equal alternatives.
Scientific Inquiry:	The act of identifying underlying principles relative to a physical or psychological phenomenon, making predictions based on those principles, and then systematically testing the accuracy of those predictions.

representation. The difference is a matter of degree, focus and conscious use.

Dimension 4: Thinking Needed to Make Meaningful Use of Knowledge

Our ultimate purpose for teaching the various forms of knowledge is to prepare our students to be able to use that knowledge in meaningful ways. As we know, one of the best ways to ensure that students fully understand the knowledge is to arrange for them to *make use of it at the time they are learning it*. Because something is meaningful to a person only if it fits with his or her goals, effective teaching involves finding ways for students to relate school knowledge to their personal goals.

We might note that the extending and refining operations listed in Figure 1 are not commonly the focus of personal goals. People don't often compare just for the purpose of comparing; they don't abstract simply for the purpose of abstracting.

Some cognitive operations, though, are more goal-directed. These operations, which we assign to Dimension 4, are briefly described in Figure 2.

For example, we call the process for creating something new *composing*. *Problem solving* is a process used to change an unacceptable situation, *decision making* is used to select among alternatives, and *oral discourse* is used to clarify information.

The process of understanding physical and psychological phenomena and

then using that understanding to make predictions about future phenomena is *scientific inquiry*. In school, a student might engage in scientific inquiry to try to understand readers' reactions to certain types of language in a piece of writing. The student could then use that knowledge to predict how various types of readers might react to other texts.

Because these processes are so clearly goal-oriented, teachers can improve student motivation by organizing instruction around them whenever feasible. For example, in a history class, students might compose essays describing events that led up to the Cuban missile crisis. They might use decision making to analyze Kennedy's reasons for blockading the Soviet missile-bearing ships, or they might engage in oral discourse to clarify some of the issues around the events leading up to the blockade.

To summarize, the classroom tasks that perhaps have the most potential for changing existing knowledge, especially when they are selected by students, are those that embody the processes listed in Figure 2.

Dimension 5: Thinking Needed to Develop Desirable Habits of Mind

The fourth principle of learning discussed earlier holds that good thinkers have certain "dispositions". These "habits of mind" include

- being clear and seeking clarity,

- being accurate and seeking accuracy,
- being open-minded,
- taking a position and defending it,
- being sensitive to the level of knowledge and feeling of others,
- avoid impulsivity.

Ennis (1985) has declared that these and similar behaviors are at the core of critical thinking. To illustrate, the learner might notice that she has a tendency to make bold assertions concerning topics she knows very little about and decide to begin trying to search her mind for evidence before she speaks. Another person might consciously strive to communicate in a clear fashion, checking to see whether others have understood his communication.

Another category of such characteristics is associated with creativity. Amabile (1983) and Perkins (1984) report that these include:

- engaging intensely in tasks even when answers or solutions are not apparent;
- pushing the limits of one's knowledge and abilities;
- generating and following one's own standards of evaluation;
- generating new ways of viewing situations outside the boundaries of standard conventions.

To illustrate, the learner might notice that she tends to "coast" through projects, expending as little energy as possible. To correct this tendency, she might "push" herself on a project, trying to do the very best she can.

The third category of desirable habits of mind are those that characterize self-regulated behavior. From research and theory in metacognition and self-efficacy (Brown 1978, Flavell 1976), we know that people can learn to:

- plan,

Fig. 3. Comparison of Selected Programs on the Dimensions of Learning

Program*	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Dimension #1: Attitudes																				
1. Self and Climate	S	S	S	S	M	-	-	-	-	-	-	-	-	-	-	-	-	M	S	-
2. Self and Others	M	S	S	M	M	-	-	-	-	M	M	-	M	-	-	-	-	M	S	M
3. Self and Task	S	S	M	S	M	S	S	S	S	M	-	-	-	-	-	-	S	S	S	-
Dimension #2: Acquiring and Integrating Knowledge																				
1. Declarative																				
a. Constructing Meaning	S	M	S	S	S	S	S	S	S	M	-	-	-	-	S	M	S	S	S	M
b. Organizing	S	M	S	S	S	S	S	S	S	M	-	-	-	-	S	S	S	M	S	M
c. Storing	S	-	M	M	S	S	S	S	S	M	-	-	-	-	M	S	S	S	S	S
2. Procedural																				
a. Constructing Meaning	S	M	S	S	M	S	S	S	S	M	-	-	-	-	-	-	M	S	-	-
b. Organizing	S	M	S	S	M	S	S	S	S	M	-	-	-	-	S	M	S	M	M	M
c. Practicing	S	-	M	S	-	S	S	S	S	M	-	-	-	-	M	S	S	S	S	M
Dimension #3: Extending and Refining Knowledge																				
1. Comparing																				
2. Classifying	-	-	-	-	S	-	-	M	S	S	M	M	S	S	M	M	M	M	S	S
3. Inducing	-	-	-	-	M	M	M	M	M	S	M	M	S	S	M	M	M	M	S	M
4. Deducing	-	-	-	-	-	-	-	-	-	M	-	-	S	S	-	-	-	-	-	-
5. Analyzing Errors	-	-	-	-	S	-	-	-	-	S	M	M	S	S	M	-	S	-	-	-
6. Supporting	-	-	-	-	S	M	M	-	M	S	M	M	S	S	M	M	M	M	-	S
7. Abstracting	-	-	-	-	-	-	-	-	M	M	M	M	S	S	M	S	S	M	S	M
8. Analyzing Value	-	-	-	-	-	-	-	-	-	M	-	-	S	S	S	-	S	-	-	S
Dimension #4: Meaningful Use of Knowledge																				
1. Oral Discourse																				
2. Composing	-	-	-	-	S	-	-	-	-	M	-	S	S	-	-	-	-	-	-	-
3. Problem Solving	-	-	-	-	S	-	-	-	S	M	S	S	S	M	S	-	S	-	-	S
4. Decision Making	-	-	-	-	S	-	-	-	-	M	M	S	S	M	S	-	S	-	-	S
5. Scientific Inquiry	-	-	-	-	S	-	-	-	-	M	S	-	-	-	-	-	M	-	-	-
Dimension #5: Habits of the Mind																				
1. Critical																				
2. Creative	-	M	S	-	M	-	M	-	M	-	S	S	M	S	S	-	-	-	-	M
3. Self-Regulation	M	-	S	M	M	-	M	M	S	-	S	S	-	M	-	-	S	-	M	-
Key:																				
S = strong emphasis																				
M = moderate emphasis																				
- = relatively little emphasis																				
* Program Key:											<p>K Olympics of the Mind. Gourley 1981.</p> <p>L Future Problem Solving. Crabbe 1982.</p> <p>M Project Impact. Winocur 1985.</p> <p>N Philosophy for Children. Lipman, Sharp and Oscanyan 1980.</p> <p>O CoRT. de Bono 1983, 1985.</p> <p>P Strategic Reasoning. Upton 1961, Upton and Samson 1963.</p> <p>Q Tactics for Thinking. Marzano and Arrendondo 1986.</p> <p>R The Skillful Teacher. Saphier and Gower 1986.</p> <p>S 4MAT. McCarthy 1980.</p> <p>T Teaching Styles and Strategies. Hanson, Silver and Strong 1986.</p>									
<p>A ITIP. Hunter 1969, 1976, 1982</p> <p>B TESA. Kerman, Kimball, and Martin 1980</p> <p>C Cooperative learning. Johnson and Johnson 1987; Slavin 1983, 1986</p> <p>D Mastery Learning. Bloom 1971; Block 1971, 1985; Guskey 1985.</p> <p>E Models of Teaching. Joyce and Weil 1986.</p> <p>F Explicit Teaching. Rosenshine 1986.</p> <p>G Active Mathematics Teaching. Good, Grouws and Ebmeier 1983.</p> <p>H BTES. Romberg 1980.</p> <p>I Strategic Teaching. Jones; Palincsar, Ogle and Carr 1987.</p> <p>J Bloom's Taxonomy; Cognitive Domain. Bloom, et al. 1956.</p>																				

- be sensitive to feedback,
- use available resources,
- be aware of their own thinking,
- evaluate the effectiveness of their own thinking.

To illustrate, the learner might make a specific plan of action for an upcoming classroom project. As he implements his plan, he might occasionally note if he is getting closer to or further away from his goal and then make cor-

rections as needed.

One of the biggest challenges teachers face is how to help their students develop the habits of mind associated with critical and creative thinking. Human history leads us to

believe that young people develop these qualities by interacting with adults who model such behaviors and by consciously practicing them.

For example, a teacher might lead a discussion on a topic such as why the Supreme Court would uphold a person's right to burn the U.S. flag. Before the discussion, the teacher might remind students of the kinds of behaviors that help make for productive discussion. As the students expressed a variety of views on the issue, the teacher would ask for evidence, inquire about the premises underlying students' positions, and call attention to inconsistencies or irrelevancies. He might also reinforce desirable behaviors by judicious recognition and praise.

The final dimension of learning, then, is thinking characteristic of critical, creative, and self-regulated people. Like positive attitudes toward learning (Dimension 1), these qualities must be fostered in an indirect but conscious way. Whenever feasible, the teacher should overtly encourage self-regulated, critical, and creative thought.

The thinking we categorize as Dimension 5 is essential to effective performance of the kinds of thinking described in the other dimensions. For example, to make sound decisions, a person needs to exhibit objectivity and attention to evidence; to solve problems well, a person needs to produce imaginative solutions through habits of mind such as persistence and commitment to high standards.

In summary, the five dimensions represent the types of thinking that facilitate effective learning. They can be used to plan instruction that will improve students' success in mastering school content while also developing their cognitive skills.

Using the Dimensions as an Analytical Tool

The dimensions framework can also be used to analyze and compare staff development programs and instructional practices. Specifically, one can determine which dimensions are emphasized in each program. Figure 3 is an analysis of 20 different programs from the vantage point of the five dimensions of learning.

In the figure, an *S* in any cell indicates *strong* emphasis on that dimension, an *M* indicates *moderate* emphasis and a - indicates that the program puts relatively little emphasis on that dimension. This is not to say that the program or practice totally ignores that area (although it might), but only that in our judgment the program or practice does not overtly deal with that dimension. For example, Figure 3 indicates that the ITIP program (Column A) is strong in the "self and climate" and "self and task" components of Dimension 1 and moderate in the "self and other" component of that dimension. It is strong in all aspects of Dimension 2. However, even though some interpretations of the ITIP program use Bloom's (et al. 1956) taxonomy, which is strong in Dimension 3 (see Column J in fig. 3), the ITIP program per se does not directly address Dimensions 3, 4 and 5, except that it is moderately geared toward enhancing some of the habits of self-regulation in Dimension 5.

In addition to being used as a tool for analyzing various programs, the dimensions can be used as a vehicle for coordinating the use of programs. Specifically, it would seem highly advisable that a school or district select programs in such a way that they cover as many dimensions (with all of their subcomponents) as possible.

The Dimensions in Practice

This article has described the dimensions as a theoretical framework that can be used for instructional planning and program coordination, but it is also a working model that has been field-tested in a number of situations. Specifically, two of the authors (Pickering and Davis) have field-tested the framework as an instructional model in an elementary school for a year. Use of the model appears to increase students' knowledge of content as well as their ability to use the array of cognitive operations needed to learn academic content. Their field-testing also disclosed that the teachers attended to Dimensions 1 and 2 in their instructional planning and implementation but infrequently addressed Dimensions 3, 4 and 5.

In addition to the field-testing that has already been done, ASCD has established a research and development

The five dimensions can be used to plan instruction that will improve students' success in mastering school content while also developing their cognitive skills.

consortium, which began in October 1989 and will end in August 1991, to test the effectiveness of about 200 strategies that have been incorporated in the model. Some 18 agencies, including 16 school districts from across the country, are participating in the consortium. ASCD also offers training in the Dimensions model as part of their National Training Center program each summer.

A Comprehensive Model for Teacher Education

The Dimensions model, which identifies five general types of thinking needed for effective learning, could eventually become the basis for a coordinated "curriculum" of preservice and inservice teacher education. At this point the model can be used to identify the cognitive focus of a number of existing staff development programs. Such an analysis allows educators to determine how these programs can be used in concert to promote student learning.

References

- Amabile, T.M. (1983). *The Social Psychology of Creativity*. New York: Springer-Verlag.
- Anderson, J. (1983). *The Architecture of Cognition*. Cambridge, Mass.: Harvard University Press.
- Block, J.H., ed. (1971) *Mastery Learning: Theory and Practice*. New York: Holt, Rinehart & Winston.
- Block, J.H. (Winter 1985). "Belief Systems and Mastery Learning." *Outcomes* 4: 2-5.
- Bloom, B.S. (1971) "Mastery Learning." In *Mastery Learning: Theory and Practice*, edited by J.H. Block. New York: Holt, Rinehart & Winston.
- Bloom, B.S., M.D. Englehart, E.J. Furst, W.H. Hill, and D.R. Krathwohl, eds. (1956) *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*. New York: David McKay.
- Brophy, J. (1982) *Classroom Organization and Management*. Washington, D.C.: National Institute of Education.
- Brown, A.L. (1978) "Knowing When, Where and How to Remember: A Problem of Metacognition." In *Advances in Instructional Psychology*. Vol 1, pp 77 - 165, edited by R. Glaser. Hillsdale, N.J.: Lawrence Erlbaum and Associates.
- Combs, A.W. (1982) *A Personal Approach to Teaching*. Boston: Allyn & Bacon.
- Costa, A. (1985) "How Can We Recognize Improved Student Thinking?" In *Developing Minds: A Resource Book for Teaching Thinking*. edited by A. Costa. Alexandria, Va: Association for Supervision and Curriculum Development.
- Covington, M.V. (1983) "Motivated Cognitions." In (Eds.). *Learning and Motivation in the Classroom*, edited by S.G. Paris, G.M. Olson, and H.W. Stevenson. pp. 139-164 Hillsdale, N.J.: Erlbaum.
- Crabbe, A.B. (1982). "Creating a Brighter Future: An Update on the Future Problem Solving Problem." *Journal for the Education of the Gifted*. 5: 2-11.
- de Bono, E. (1983). "The CoRT Thinking Program." In *Thinking and Learning Skills: Vol. 1. Relating Instruction to Research*, edited by J.W. Segal, S.F. Chipman and R. Glaser, pp. 363-388. Hillsdale, N.J.: Erlbaum.
- Denham, C., and A. Lieberman, eds. (1980). *Time to Learn*. Washington, D.C.: National Institute of Education.
- Ennis, R.H. (1985). "Goals for a Critical Thinking Curriculum." In *Developing Minds: A Resource Book for Teaching Thinking*, edited by A. Costa, pp 54-57. Alexandria, Va.: Association for Supervision and Curriculum Development.
- Estes, W.K. (1982). "Learning, Memory, and Intelligence." In *Handbook of Human Intelligence*, edited by R.J. Sternberg. London: Cambridge University Press.
- Flavell, J.H. (1976). "Metacognitive Aspects of Problem Solving." In *The Nature of Intelligence*, edited by L.B. Resnick. Hillsdale, N.J.: Erlbaum.
- Glatthorn, A.A., and J. Baron (1985). "The Good Thinker." In *Developing Minds: A Resource Book for Teaching Thinking*, edited by A. Costa, pp 54-57. Alexandria, Va.: Association for Supervision and Curriculum Development.
- Good, T.L. (1982) "How Teachers' Expectations Affect Results." *American Education*. 18, 10: 25-32.
- Good, T.L. and J.E. Brophy. (1972) "Behavioral Expression of Teacher Attitudes." *Journal of Educational Psychology*. 63, 6: 616-624.
- Good, T.L., D. Grouws, and H. Ebmeier. (1983). *Active Mathematics Teaching*. New York: Longman.
- Gourley, T.J. (1981). "Adapting the Varsity Sports Model to Non-psychomotor Gifted Students." *Gifted Child Quarterly* 25: 164-166.
- Guskey, T.R. (1985). *Implementing Mastery Learning*. Belmont, Calif.: Wadsworth Publishing Co.
- Hanson, R.J., H.F. Silver, and R.W. Strong. (1986). *Teaching Styles and Strategies*. Moorestown, N.J.: Hanson Silver Strong & Associates.
- Harter, S. (1982). "A Developmental Perspective in Some Parameters of Self-Regulation in Children." In *Self-Management and Behavior Change: From Theory to Practice*. edited by P. Karoly and F.H. Kanfer. pp 165-204. New York: Pergamon Press.
- Hunter, M. (1969) *Teach More Faster!* El Segundo, Calif.: TIP Publications.
- Hunter, M. (1976) *Improved Instruction: Take 10 Staff Meetings as Directed*. El Segundo, Calif.: TIP Publications.
- Hunter, M. (1982) *Mastery Teaching*. El Segundo, Calif.: TIP Publications.
- Johnson, D.W., and R.T. Johnson. (1987) *Learning Together and Alone*, 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall.
- Johnson, D.W., R.T. Johnson, P. Roy, and E.J. Holubec. (1984). *Circles of Learning: Cooperation in the Classroom*. Alexandria, Va.: Association for Supervision and Curriculum Development.
- Jones, B.F., A.S. Palincsar, D.S. Ogle, and E.G. Carr. (1987). *Strategic Teaching: Cognitive Instruction in the Content Areas*. Alexandria, Va.: Association for Supervision and Curriculum Development.
- Joyce, B., and M. Weil. (1986). *Models of Teaching*. Englewood Cliffs, N.J.: Prentice-Hall.
- Kerman, S., T. Kimball, and M. Martin. (1980) *Teacher Expectation and Student Achievement: Coordinator's*

Manual. Bloomington, Ind.: Phi Delta Kappa.

Lipman, M. (September 1988). "Critical Thinking - What Can It Be?" *Educational Leadership*. 46: 38-43.

Lipman, M., A.M. Sharp, and F.S. Oscanyan. (1980). *Philosophy in the Classroom*. 2nd ed. Philadelphia: Temple University Press.

Marzano, R.J., R.S. Brandt, C.S. Hughes, B.F. Jones, B.Z. Presseisen, C.S. Rankin, and C. Suhor. (1988). *Dimensions of Thinking: A Framework for Curriculum and Instruction*. Alexandria, Va.: Association for Supervision and Curriculum Development.

Marzano, R.J. and D.E. Arredondo. (1986). *TACTICS for Thinking*. Alexandria, Va.: Association for Supervision and Curriculum Development.

Maslow, A.H. (1968). *Toward a Psychology of Being*. New York: Van Nostrand Reinhold.

McCarthy, B. (1980). *The 4MAT System*. Oak Harbor, Ill.: Excel, Inc.

McCombs, B. (1986). "The Role of the Self-System in Self-Regulated Learning." *Contemporary Educational Psychology* 11: 314-332.

Ogle, D. (1986). "K-W-L: A Teaching Model That Develops Active Reading of Expository Text." *The Reading Teacher* 39: 564-576.

Paris, S.G., and B.K. Lindauer. (1982). "The Development of Cognitive Skills During Childhood." In *Handbook of Developmental Psychology*, edited by B.W. Wolman. Englewood Cliffs, N.J.: Prentice-Hall.

Paris, S.G., M.Y. Lipson, and K.K. Wixson. (1983). "Becoming a Strategic Reader." *Contemporary Educational Psychology* 8: 293-316.

Perkins, D.N. (1984). "Creativity by Design." *Educational Leadership* 42, 1: 18-25.

Romberg, T. (1980). "Salient Features of the BTES Framework of Teacher Behaviors." In *Time to Learn*, edited by C. Denham and A. Lieberman. Washington, D.C.: Institute of Education.

Rosenshine, B.V. (1986). "Synthesis of Research on Explicit Teaching." *Educational Leadership*. 43, 7: 60-69.

Rumelhart, D.E., and D.A. Norman (1981). "Accretion, Tuning and Restructuring: Three Modes of Learning." In *Semantic Factors in Cognition*, edited by J.W. Colton and R.

Klatzky. Hillsdale, N.J.: Lawrence Erlbaum.

Saphier, J., and R. Gower. (1986). *The Skillful Teacher*. Carlisle, Mass.: Research for Better Teaching.

Slavin, R.E. (1983) *Cooperative Learning*. New York and London: Longman.

Slavin, R.E. (1986) *Using Student Team Learning*. Baltimore: Center for Research in Elementary and Middle Schools, Johns Hopkins University.

Upton, A. (1961). *Design for Thinking*. Palo Alto, Calif.: Pacific Books.

Upton, A., and R. Samson. (1963). *Creative Analysis*. New York: E.P. Dutton.

Vosniadou, S., and W.F. Brewer. (1987) "Theories of Knowledge Restructuring in Development." *Review of Educational Research* 51, 1: 51-67.

Weiner, B. (1972). "Attribution Theory, Achievement, Motivation and the Educational Process." *Review of Educational Research* 42: 203-215.

Weiner, B. (1983). "Speculations Regarding the Role of Affect in Achievement-Change Programs Guided by Attributional Principles." In *Teaching and Student Perceptions: Implications for Learning*, edited by J.M. Levine and M.C. Wang. pp. 57-73. Hillsdale, N.J.: Lawrence Erlbaum.

Winocur, S.L. (1985). "Project IMPACT." In *Developing Minds: A Resource Book for Teaching Thinking*, edited by A. Costa. Alexandria, Va.: Association for Supervision and Curriculum Development.

Authors' note: We would like to acknowledge the following as co-developers of the Dimensions of Learning framework: Daisy E. Arredondo, Guy J. Blackburn, Deena L. Davis and Robert W. Ewy.

Robert J. Marzano is Director of Research, Mid-Continent Regional Educational Laboratory, 12500 E. Iliiff Ave., Suite 201, Aurora, CO 80014. **Debra J. Pickering** is Staff Development Specialist in the Cherry Creek Public Schools, 7855 S. Willow Way, Englewood, CO 80112. **Ronald S. Brandt** is ASCD's Executive Editor.

Reprinted with permission from Educational Leadership (Feb 1990).

SALLY TANG

Helping Children Learn

The Role of the Media Department

Slogging it out in the Institute of Education library one day when I was doing research for an assignment for the FPDE course, I let out a sigh that drew smiles from equally tired faces around me.

I had been reading and re-reading the section on 'HOW PUPILS LEARN' in Chris Kyriacou's *EFFECTIVE TEACHING IN SCHOOLS* a book which, according to the blurb, both student and experienced teachers and all those concerned with teacher education and staff development should not miss.

'In essence, Piaget's theory of cognitive development deals with the child's cognitive structure through assimilation and accommodation; this refinement is governed by a combination of the child's interaction with the environment (with an emphasis on active exploration) and the processes of ...'

Piaget, Bloom, Kerry,... I gave up reading the blooming theories and went home. What I needed was a book on how to HELP Teachers LEARN how to HELP PUPILS LEARN - a simply written one. A few days later, I had the chance to go through key sections of the book with the friend who had recommended the book, and discuss issues raised. And what a difference it was! I found so much meaning in the book when I was able to discuss it with someone who knew it well.

This experience made me realise what proper promotion of books could do for both teacher and student. Book promotion is an area of concern for me because I am in charge of my school media library.

Importance of the Media/Resource Department

More than any other department the Media/Resource department is the one that can HELP TEACHERS TEACH so that they can HELP PUPILS LEARN. Principals who recognise the importance of this department and ensure that they have sufficient suitable teachers involved in the promotion of learning materials, and have a large percentage of their students hooked on books are the ones who produce independent learners and have fewer discipline problems. The lover of books has little time for loitering around shopping centres and mixing with bad company, or experimenting with drugs. He has no need to resort to such means of passing his time. Statistics show that those who give trouble are those who are less academically-inclined and need to work out their frustrations. Statistics also show that those who read a lot do better academically than reluctant readers.

This is why External Appraisal Teams always emphasize the need for a sustained programme of activities to promote reading.

Enthusiastic teacher librarians who love books are what the Media department needs. Teachers who read only text books cannot convince students of the importance of books in their development. English/Literature teachers would be an asset in the Media Team. They would have little problem getting students under their charge to act out parts of books during Assembly periods to stimulate interest in fiction and Literature books.

Involvement of other Heads of Department

The Media Head should involve other Heads of Department (HOD) in the selection of print and non-print material for each department. Media crosses all boundaries. It would be wrong to think that selection and acquisition of material for the Media Library is the sole responsibility of the Media department. It is only logical to involve the other HODs in the selection and acquisition of resources because with their specialist knowledge of their own discipline, they will know what best to get for their programmes. Furthermore, there is the question of ownership. If HODs are involved in this way, and their contributions acknowledged, they will share ownership of the Media Library Centre and help work towards making it a success.

More than any other department, the Media/Resource department is the one that can help teachers teach so that they can help pupils learn

Enhancing Self-image

With an enthusiastic team, the Media department can contribute greatly to the enhancement of self-image of pupils in the school. My school has an annual event called BOOK AND MUSIC WEEK which our students always look forward to. The last 'Book and Music Week' we celebrated had the theme 'Towards Creativity'. Activities planned were geared towards fostering team-spirit and giving the students a chance to come up with something original. Every class had to participate in a concert. What is more, the students were encouraged to write their own plays, or adapt plays, or choreograph their own dances. There were prizes galore for competitions and quizzes organized: we had a Mathematics quiz, a Music quiz, and a Book quiz, a book fair and talentime for the more musically-inclined. It was a week to remember, especially for the school's poorer achievers who enjoyed 'doing things' rather than studying.

Talking about the event afterwards with our weaker girls, I realised how much students dislike labelling. They said that they liked contributing items for the exhibition and decorating their own class to reflect the theme without being told by teachers what should be done. They liked being able to think for themselves. They liked being placed on an equal footing with the smarter girls, and winning some of the prizes. They liked being 'clever'.

What they said is food for thought. It makes you realise why Roger McGough wrote this poem:

Streemin

Im in the bottom streme
which means Im not brigh
dont like reading
cant hardly write

but all these divishns
arnt realy fair
look at the cemetery
no streemin there.

Kyriacou (1986) also warns against the way in which the teacher's choice of words may contribute to the effects of 'labelling' pupils: the process by which pupils come to see themselves

What teachers really want is the chance to learn from others what really works and what pitfalls to avoid in our attempts to help our students

and act more in accordance with the labels that teachers typically use to describe them. He says that as well as overt examples of such labelling, for example, when a pupil is described as a 'trouble maker', there are also covert examples, such as when a pupil is never invited to contribute to a discussion or expected to do better. Being set in a low stream or band, he says, fosters underachievement through its effect on pupils' attitudes and self-esteem.

Back in school now, after my FPDE course, I am determined to do something for our weaker students which I hope will boost their morale and self-image. I applied for financial assistance from the Singapore Totalisator Board to upgrade my Media Library Centre and got \$50 000.00 for the school. Most of the money is going towards the purchase of computers which fellow Media Team members and I will use to teach our Sec 3 students, starting with our Normal students, the Word Perfect program. This is in line with our Pastoral Care aims of caring for our students and providing them meaningful enrichment activities. It will be another first for our weaker students, for computer technology is normally associated with the more brainy.

Later, when we are better equipped and trained, we will venture into greater use of computer technology to help our students. Well-designed instructional programs, given their characteristics such as small-step learning, self-pacing, active participation and immediate feedback, and overlearning are ideally suited for students with special needs.

Though there are books galore on what makes for effective teaching, what teachers in Singapore really want is the chance to learn from others what really works and what pitfalls to avoid in our attempts to help our students. HODs fresh from the FPDE course, especially, will welcome platforms for professional sharing, for they will find, upon their return to school, that

*There is nothing more difficult to attempt,
more perilous to conduct,
or more uncertain in its success,
than to take the lead in the introduction
of a new order of things.
Because the innovator has for enemies
all those who have done well
under old conditions,
and only lukewarm defenders
in those who might do well
under the new.*

(Bender, 1983)

Reference

Kyriacou Chris, (1986) *Effective Teaching in Schools*, Oxford: Basil Blackwell.

Bender, P.S., (1983) *Resource Management*, Wiley-Interscience Pub.

Sally Tang is Head of Department/Media, Katong Convent, Singapore

FRANCIS P. HUNKINS

Sharing Our Instructional Secrets

Explaining teaching strategies to students allows them to derive more meaning and enjoyment from their classes and have greater control over their own learning.

"Class, today we begin our study of India. I have several ideas about how I want to treat this topic. I plan to present some information to you just to provide background. However, in much of this unit, I will be using teaching strategies that will allow you to collect data and then to organize them in particular ways. You will decide many of your directions of study. One method I plan to use quite a bit is the Taba strategy, which has three stages: (1) concept formation, (2) interpretation of data, and (3) application of principles. When we use this strategy, I will go over it in more detail; however, let me say at this time that the reason for using it is to allow you to be more involved in processing the information on India. Also, it will help you assume more responsibility for forming particular questions and deciding avenues of investigation. I hope it will make your studies more enjoyable.

"As we use a variety of methods in our study of India, we will see many ways in which we can investigate topics. In learning these strategies, we can become skilled in generating our own strategies."

This kind of talk is uncommon in classrooms. Teachers rarely introduce new units by explaining the procedures they will use and their rationale. Although they discuss tried-and-true classroom activities and various teaching theories with their colleagues, they often ignore an impor-

tant participant in the educational scene - the student.

Yet students at any age can benefit greatly from being aware of the processes they use in their learning. Such awareness has been identified as *metacognition* - consciously being aware of our own and others' cognitive operation. The key to benefiting from metacognition is the conscious regulation and direction of thought, which requires that we step back and consider just what we have been doing cognitively. This is something that can be taught.

Sharing Our Methodological Secrets

Most teachers emphasize specific content in their classes. Theorists identify this as "knowledge that" - referring to the specific facts, concepts, rules, principles, generalizations, and theories that teachers think are important for students to know. They seldom give equal time to what theorists call "knowledge how" - various ways of processing information and advancing knowledge.

Even in mathematics and composition, where processes are taught, teachers usually do not teach *how to learn*. For example, they do not take time to help students discover that professional mathematicians argue over how to approach and process certain mathematical information.

Stressing "knowledge how" involves teaching how mathematicians, biologists, historians, or fictional writers ask questions to furnish the necessary focus for action. As students view the world from these perspectives, they begin to comprehend how one goes about learning.

When to Share Our Secrets

Teachers can reveal their instructional secrets by directly teaching specific instructional strategies at the beginning of lessons; taking a class period or more before the unit begins to teach a strategy that is appropriate for the particular lesson; or distributing handouts that list the steps of the strategy, the places where it is appropriate, and how to ask particular questions at each step.

Sometimes an instructional strategy is more effective when students are having problems with the lesson. Perhaps, in a current events lesson, two newspaper accounts report the same event differently, and students are unsure of how to process the discrepancy. Here teachers can assume the role of consultant and use the "teachable moment" to teach formally what to do. Or suppose students read a description of the demise of the Mayan culture of Central America and are asked to theorize why the culture declined at a particular time. This is a "discrepant

Although they discuss tried-and-true classroom activities and various teaching theories with their colleagues, they often ignore an important participant in the educational scene - the student.

event" requiring investigation, at which point the teacher can introduce an inquiry strategy that will enable students to reach conclusions.

Specific Secrets

What secrets can teachers share? They can tell students the names of the strategies and the reasons they are used in certain situations. They can schedule time to teach the steps of specific strategies, explaining the rationale for each. They can discuss particular types of questions and how to put them into questioning strategies. They can also allow students time to formulate their own questions, drawing on information shared in class.

The Taba method is an inductive teaching strategy that many teachers know. In the example at the beginning of this article, the teacher formally explains the method to her class. She says that the first stage of the Taba method is concept formation, but first tells the class that they will play a major role in planning just what and how they will study about India. With the teacher's guidance, the students pose the key questions they have about India, note that they will primarily be using the Taba strategy, and list some expected outcomes of their investigations. This is part of the planning that students need to experience and a key aspect of executive control - the regulation of cognition.

The students generate a list of questions about the culture of India. Some list specific questions on how the religious beliefs of these people affect their daily lives; other focus on whether the Indian culture is modern compared with other cultures in the world. The teacher has the students look at their questions to determine types and purpose (assuming that she has given them some formal lessons on types of questions - perhaps a brief version of Bloom's *Taxonomy of Educational Objectives* with sample questions under each category).

Suppose one student asks how the health of Indian people compares with that of Americans, and another wants to know how many major languages are spoken in India. The teacher directs each student to classify his or her question and note the reasons for it. On reflection, the first student realizes that her question could be an

analysis question at its highest level, and at its lowest level a comprehension question. She decides it is a comprehension question. The second student classifies his query as a knowledge question, but one of importance in determining India's cultural diversity. The students note these and other questions at the beginning of the lesson as beacons to guide their investigation.

The teacher now goes to the task of concept formation, reviewing that this stage has three steps: (1) identifying and listing relevant data, (2) grouping the data according to similarities, and (3) labeling the categories of data. She notes that this stage helps make sense of the vast amount of information that will be covered.

The students then form learning teams for processing the information. The teacher has provided various types of materials: books, encyclopedias, newspapers, and magazines. She also gives them a handout listing the steps of concept formation, with examples of the types of questions that can be asked at each step. Students realize that the original listing of data will be primarily in response to knowledge questions such as "What information can I gather about Indian culture or about India in general?"

When students have completed their lists of data, they will have to group them by asking questions to determine

Students at any age can benefit greatly from being aware of the processes they use in their learning.

common attributes. Questions such as "What items belong together?" can be at the comprehension or analysis level. Students who have difficulty with this can either ask a fellow student or gain specific guidance from the teacher, who encourages them to monitor how they process the data. This monitoring function is part of executive control. If students are not getting information that they deem useful to their focus, they can revise the questions they are asking.

After the students have organized the information into clusters, they must ask analysis questions to determine the key attributes of the information organized, and synthesis questions to generate labels for the information. Again, the teacher must have introduced these types of questions to students and shared the secrets of questioning.

At the conclusion of this first stage, the class has clustered data under the categories of clothing, food, village life, city life, religion, and art. The students must now ask evaluation questions to determine if these categories are useful. This is the third major stage of executive control - checking outcomes. The teacher might also ask them to evaluate how they generated the categories. In a class discussion, students could share their methods of processing the information. The teacher might point out that being aware of the questions we ask helps us remember the information and the reason for organizing it, and discussing this phase of concept formation is a rehearsal for the next time concept formation is used. Structured rehearsals of strategies result in their being used later in similar settings (Ringel and Springer 1980).

After the students have judged that their categories are valid, the teacher can directly teach the steps of the second stage of the Taba strategy, the interpretation of data, which include (1) identifying points, (2) explaining items of identified information, and (3) making inferences. The students continue working in teams, taking the data generated in the first stage and asking questions that will take them through the interpretation stage. The students are encouraged to ask questions such as "What are some important aspects of village life in India?" and "Why do you think such activities

Teachers can tell students the names of the strategies and the reasons they are used in certain situations ... [and] can schedule time to teach the steps of specific strategies, explaining the rationale for each.

occur?" To shift the focus, the teacher could ask, "How might we describe the key features of Indian art?"

The students are then guided through the other two stages, finally being asked (or asking their own) synthesis questions to generate inferences or conclusions about Indian culture. The teacher again takes class time to discuss the procedures, encourage students to consider the reasons for their actions, and explain the rationale for what she has been doing. Thus, students realize that they are responsible for their learning and that the teacher is serving as a guide and process critic.

The third stage of the Taba strategy, the application of principles, is dealt with similarly. The teacher explains that the stage has three sets of operations: (1) predicting consequences or hypothesizing, (2) explaining predictions and hypotheses, and (3) verifying the predictions. The students are given time to use this information by either adding more depth to their understanding of Indian culture or using their knowledge of it as a basis for analyzing other cultures.

Learning to Learn

A multitude of other strategies is available, and teachers should know the specifics of many of them. But they should also teach these strategies to their students. By sharing their instructional secrets with students, teachers will enable them to be more capable, efficient, and satisfied learners.

Reference

Ringel, B.A., and C. Springer. "On Knowing How Well One Is Remembering: The Persistence of Strategy Use During Transfer." *Journal of Experimental Child Psychology* 29 (1980).

Francis P. Hunkins is Professor of Education, University of Washington, College of Education, 115 Miller Hall, DQ12, Seattle, WA 98194.

Reprinted with permission from Educational Leadership (Nov 1987)

NORA REDDING

The Empowering Learners Project

In Aurora, Colorado, the secret is out. Teachers are sharing their knowledge about learning and thinking with students to help them become autonomous learners.

In a quest to make schooling more effective, educators can choose from myriad solutions and programs designed to "fix it". Our district, to date, has offered classes in Madeline Hunter's Instructional Theory Into Practice, Teacher Expectations Student Achievement (TESA), Assertive Discipline, writing across the curriculum, thinking skills, 4-MAT, cooperative learning, learning styles, cognitive learning styles, peer coaching, reading in the content areas, and others.

To coordinate these disparate endeavors, we searched for a framework that would validate having differing people attacking the same problems in different ways. We sought a banner that would unite our efforts. Finding a common link proved elusive *until* we turned our attention away from the programs and what teachers do and onto our students and the process of learning.

Now our rallying cry has become, "Let's empower our students with knowledge about how learning occurs." We call our program the Empowering Learners Project, and our goal is to share with our students what we as professionals know about learning and thinking. It doesn't matter, then, whether a teacher is using TESA, writing across the curriculum, thinking skills, or learning styles. Our teachers tell their students what approach is being used, explain why, and help them assimilate and apply that knowledge in becoming independent

learners.

Empowering our students essentially means four things: (1) teaching students what enhances and what impedes learning; (2) helping them recognize and further develop their own personal learning strengths; (3) teaching them specific thinking and learning strategies; and (4) passing on the responsibility for learning to them.

It doesn't matter whether a teacher is using TESA, writing across the curriculum, thinking skills, or learning styles. Our teachers tell their students what approach is being used, explain why, and help them assimilate and apply that knowledge.

Learning Enhancement

First, we want our students to learn which behaviors and attitudes intensify learning and which inhibit it. They should know how novices differ from skilled learners and should be able to identify the characteristics of effective thinkers. A few representative examples will illustrate the variety.

The Hunter model. Teachers providing anticipatory set should also teach (1) the importance of focusing attention before attempting to learn and (2) the need to access prior knowledge in order to link new information to what is already known. Whether they use the term *anticipatory sets* with students is unimportant. What is important is that teachers explain what they are doing and why. For another example, teachers using closure should explain how an immediate review of new learning increases retention. Their students should understand that by relating new information to personal interests, experiences, and needs in as many ways as possible, they are creating links to that information that will help them recall and apply it later.

Writing across the curriculum. Students who are asked to do mapping, webbing, or graphing activities should know that effective learners organize information in personally designed structures for storage in memory. They should also appreciate the power of "chunking" (organizing information in packages for efficient recall and use) and understand how the

graphics they create help chunking to occur.

TESA. Teachers trained in TESA should explain to their classes why they persevere when a student doesn't respond immediately. Their students should know some critical differences between skilled and unskilled learners; for example, the skilled learner believes she can succeed; therefore, even when the answer isn't apparent or the first solution doesn't work, she keeps trying. On the other hand, if the problem isn't easy, the unskilled learner believes he can't do it and gives up too soon. What's more, students should be able to identify - and celebrate - examples of effort and perseverance in their own behavior and in that of their classmates.

Peer coaching. Peer coaching does not involve students directly, but it offers another opportunity to teach about learning. When the peer coach comes to observe, the teacher can explain the purpose of the visit: to provide feedback to help her be self-reflective and analytical about her work. She can become a living example of the importance of planning, monitoring, and reflecting on performance.

Personal Learning Strengths

The second area of concentration in our project involves (1) making students aware that different people have different learning styles and strengths and (2) helping them recognize their own strengths and develop additional ones. As with all the other goals of Empowering Learners, each teacher will include whatever information is relevant to the instructional theory or strategies he uses. The following examples illustrate what we have done.

Learning styles. Teachers knowledgeable about learning styles can share useful insights about learning strengths with their students. They can help students understand elements of their styles, such as:

- environmental preferences (At what time of day or in what type of lighting do I learn best?);
- structure preferences (Do I learn best from an authority figure, with friends, or by myself?

We believe teachers should give students choices - not necessarily in learning outcomes but in methods of reaching them.

Do I work best in a free environment or in a highly structured setting?);

- modality strengths (Am I a visual, auditory, tactile/kinesthetic, or emotive learner?);
- cognitive strengths (Am I a holistic or an analytical thinker? Do I categorize broadly or narrowly?)

Once a student has identified her own preferences, she can learn how to adapt learning tasks to her strengths and how to reinforce her areas of weakness.

Cooperative learning. One of the purposes of working in small cooperative groups is to learn from and help one another, not only in learning content but also in developing learning strengths. Teachers can stress the power of perceiving, representing, and communicating information in different ways. They can encourage students to teach each other from their special and particular perspectives. For example, a visual learner might represent information with a picture or chart, the auditory learner can explain the information in her own words, and a kinesthetic learner can add rhythm or movement to his presentation. Each can then explain to the others how he conceptualized his demonstration and help his classmates develop the ability to do likewise.

Writing across the curriculum. Teachers can point out the different ways writing tasks can be used to support modality preferences or cognitive strengths. For example, as a memory device, visual learners might be en-

couraged to draw illustrations, while auditory learners can rewrite information for a younger person. Holistic thinkers can turn sequential information into pictures, symbols, or Venn diagrams, while analytic thinkers might compose hierarchies, flowcharts, or webs. Further, teachers can stress that matching the writing activity to the style of the student can enhance the learning of difficult material and that practicing easy material through a learning style weakness can help develop new strengths.

Thinking skills. Teachers trained in thinking skills instruction can also address learning strengths. For example, the deep processing lesson from *TACTICS for Thinking* (Arrendondo and Marzano 1986) teaches how to store new knowledge in memory for increased retention. The student learns to represent the information in four ways: visually, through self-talk, with sensory details (sounds, smells, and so on), and emotionally. As students learn the technique, they can also learn about modalities and how the four components relate to different learning styles. They should then understand that deep processing is a method of using their modality strength and at the same time strengthening areas of weakness.

Specific Learning Strategies

The third goal of the Empowering Learners Project is to teach specific learning and thinking strategies. In this instance, a guideline for teachers is to be sure, whenever giving an assignment, that students know the specific thinking strategies required to complete it. In addition to naming and providing direct instruction in them, teachers should help students anticipate how those strategies might transfer to other classes and to situations outside school. Here are some examples.

Reading in the content areas. Teachers who have learned reading comprehension methods should not keep that knowledge a secret from their students. When conducting a pre-reading activity, such as having students pose questions for an upcoming reading assignment, for example, they explain the purpose of the ac-

tivity. Their students learn that predicting and posing questions serve to focus the reader's attention, promote access to prior knowledge, help define main points, and raise the reader's level of engagement. After students understand the strategy, their teachers can help them anticipate other uses for it, for example, when viewing a documentary or listening to a lecture.

Thinking skills. The teacher who instructs his students in critical thinking should do more than teach strategies such as detecting errors in logic, evaluating evidence, or checking for support. Knowing how to check for evidence or justify a claim is not enough if a student is wildly impulsive or closed-minded. The teacher should also convey that critical thinking is dispositional in nature. That is, certain dispositions, such as the tendencies to seek clarity and accuracy, resist impulsivity, and remain open-minded, promote the use of critical thinking. The teacher should also help his students anticipate situations in and out of school in which critical thinking is important, for example, making consumer choices or political decisions.

Responsibility for Learning

The last goal of our project is to pass on the responsibility for learning to our students. We attempt to do this through pep talks, choices, and rewards. Pep talks can range from the cliché ("You can lead a horse to water ...") to the highly personal ("I never realized my own responsibility for learning until ..."). One teacher hung a banner of a quotation from her pep talk above the chalkboard: "The primary cause of learning is the activity of the learner's own mind." Students discussed and then wrote their reactions to this sentence. They agreed almost unanimously that even the best teaching could not *make* them learn. They realized that their own effort or lack of it would ultimately determine their level of success.

In addition to pep talks, teachers should give students choices - not necessarily in learning outcomes but in methods of reaching them. Once students understand something about learning theory, they can easily explore how to approach a learning task.

Once students understand something about learning theory, they can easily explore how to approach a learning task.

With the freedom to choose strategies and activities effective for their particular learning styles, they are more apt to assume responsibility for their own learning.

Last, teachers can recognize success with rewards. These might range from verbal reinforcements ("I noticed you really stuck with that difficult problem - good perseverance!") to points on a test ("Describe the learning strategies you used to prepare for this exam."). Students can also be encouraged to reinforce each other. For example, members of cooperative learning groups can evaluate each other for use of effective strategies or point out a learning strength they noticed in a classmate.

Pep talks, choices, and rewards should occur often throughout the year. Frequent reminders will create a climate in which students think of themselves as powerful, autonomous learners and, as a result, begin to assume responsibility for their own progress.

Breaking Old Habits

One year into the program, interest in the Empowering Learners Project has spread widely among our teachers. However they are finding the philosophy easier to agree with than to put into practice. Thinking of students as dependents is a perspective difficult to replace. Even though they agree students should understand the process of learning, the old habit of keeping secrets persists.

For example, one teacher reported negative effects from using extended wait-time in class. Asked what explanation she had given her students

for making this change, she replied, "I didn't tell *them* what I was doing."

Her staff development instructor protested, "But that's the whole point of Empowering Learners - letting the students in on the strategies of learning."

"We can't do that," she replied. "We would teach ourselves right out of a job!"

Nevertheless, some teachers are finding that when they explain the learning principles on which class activities are based, students begin to sense their own potential and become more active in their own learning. In one case, an entire class suggested to their teacher how he should revise the course for the following year. In another, a group of freshmen became so involved in their science class that they began calling their teacher in the evenings to ask technical questions.

Thus far in the program, we have seen improvement of *instruction*. Explaining the theory base to students has helped teachers become more strategic, more aware of the link between their instruction and the resulting learning of their students.

The ideal is still to come - improvement of *learning*. As one teacher said, "The Empowering Learners Project isn't about my doing my job better. It's about teaching my students to do *their* jobs better." That's exactly it.

Reference

Arredondo, D.E., and R.J. Marzano (1986). *TACTICS for Thinking Training Program*. Alexandria, Va: ASCD.

Nora Redding is High School Curriculum Coordinator, Aurora Public Schools, Division of Instruction, 1085 Peoria St., Aurora, CO 80011-6297.

Reprinted with permission from *Educational Leadership* (Feb 1990).

KENNETH STOTT

Using the Outdoors: A Different Approach to Manager and Management Development

**Outdoor Management Development provides
a powerful and stimulating tool for
learning where effects of decision are
felt with immediacy**

There is growing interest in the use of outdoor components in management programmes. This article examines what Outdoor Management Development is and the processes involved, and describes the work which is currently taking place in Singapore in the education field.

Over the past fifteen months, some casual observers in Singapore may have seen mature men and women climbing trees, tearing maps and crawling under bushes. On one occasion, they may have even seen them trying to balance precariously on planks and eventually falling into the sea. Some of these observers may reasonably have asked what all this has to do with making people better at their jobs, be it school principals, leaders of voluntary organisations, or managers from commercial and industrial concerns.

What is Outdoor Management Development?

The system of training, of which such above may form a part, is called Outdoor Management Development, or OMD for short. It uses outdoor exercises to help managers develop their skills. It is no surprise that participants are often seen to be enjoying them-

ves: OMD is intended to provide a fun way of learning in a pleasant and challenging environment.

OMD is also a very serious business - it has to be in view of the organisation and extensive resource commitment involved. The system has to be seen essentially as the development of managers (traditionally undertaken in the classroom) but using the outdoors as a powerful and stimulating environ-

ment. "Classroom teaching we can neatly allocate (relegate) to an appropriate memory file ... physical and real experience is more likely to perturb" (Mossman, 1982). By putting people in problem situations which are very real in themselves (as opposed to paper exercises in the classroom) the effects of decisions are felt in a real way. For example, a group of school principals was given the task of



Decisions, decisions

navigating some unfamiliar terrain. Some critical decisions had to be taken about directions and time. Had the decisions been inappropriately conceived, they could easily have been lost for over four hours. The consequences would have been at least uncomfortable. Under these circumstances, learning is intensified and it is argued by leading exponents of the systems that learning is a speedier process than by any other method of training.

Unlike more conventional forms of training, this system tends to expose individuals, since the circumstances generally dictate that they cannot hide from their participating colleagues nor from situations which the exercises provide. In some exercises, participants may be under extreme pressure, operating with unpredictable people and unpredictable events, and these may simulate the conditions under which they work as managers in their own organisations. From these situations comes clear data about performance, and this can be used as a basis for feedback and questioning.

Programme focus

Most OMD activities focus on the development of process and interpersonal skills. The exercises are designed to relate to processes involved in management jobs, and to

employing intellectual, physical and emotional skills in harmony. Mossman (1983) identifies two different levels: 'manager development' which concentrates on individual performance, and 'management development' which looks at collective performance. The latter focus may be particularly relevant to those organisations which send a complete management team on a programme so that they can consider their working relationships. It is argued that an understanding of colleagues' behaviour in high pressure situations will help managers understand each other better at work when difficult tasks emerge. So, for example, a school which genuinely uses its management team to manage the school may go on a programme together in an attempt to acquire a fuller understanding of colleagues and their preferred behaviours.

Progressive challenge

OMD programmes which are skilfully designed make learning a progressive experience. Managers may be not only at different stages of personal development, but their managerial roles may have substantially different emphases. For example, for a manager with a highly complex role, such as that of a school principal, to deal with simple problems which have established successful solutions would

hardly be challenging. It would be better to focus on a simple problem to which there is no clear solution. In this way, the manager learns how to work with colleagues in evaluating potential solutions and how to implement them effectively. As skill emerges in dealing with solution uncertainty, managers may then be presented with increasingly ambiguous problems. This clearly parallels the situations at the top of organisations (particularly schools) where the work is complex, environmental demands uncertain and where there is much ambiguity in terms of problem definition and solution.

An OMD programme reflects these progressive development needs. In the early stages, an exercise might demand that participants cross an obstacle using some materials which are provided and within a given time. Later, the problem itself may be made more complex and the solution uncertain. For example, participants may have to handle a mass of apparently unrelated information. Codes and cryptic clues may be used and these can only be deciphered when they arrive at various locations. They may then need to set up a system of responsibilities and procedures in order to manage the task. Such an exercise would test assumptions and call on a host of organisational interpersonal skills, as well as demanding a need to prioritise effectively.

OMD objectives

There are several objectives which OMD might attempt to achieve. Creswick and Williams (1979) talk about results being achieved at personal, managerial and team levels whilst Mossman (1982) identifies:

- (i) personal growth
- (ii) manager development
- (iii) team development
- (iv) management and organisation development
- (v) assessment

Those who have taken part in programmes may well support several of these objectives but it is important that the desired outcomes are identified before the learning experience is designed. Whilst personal growth may be seen as integral to manager development, the rather vague nature



School principals discovering the inadequacies of their planning process



If we go that way, we'll end up in Bangkok

of claims such as 'the building of leadership qualities' may do little to support the notion of OMD having a direct effect on performance in the workplace.

Programme patterns

The pattern of courses is also a vital consideration. The work currently being undertaken in OMD by the team from the Institute of Education is based on Kolb et al.'s (1971) four stage model of experiential learning. The first stage 'concrete experience' is represented by the outdoor exercises which yield learning data. The second stage 'reflection/observation' is covered by discussion and reviews of what took place. These may be supported by observations from facilitators and co-participants and by the use of video. The next stage 'abstract conceptualisation' is effected through reference to appropriate theory by reinforcing congruence and identifying preferable practice. The final stage 'active experimentation' refers to the statements of intent about revised practice in the next exercise or in the workplace.

This well established framework has been highly successful in directing the focus away from the physical activity (used simply as a vehicle for learning) and firmly towards the transposition of learning to managerial practice. In order to improve the whole process for some learning objectives, the In-

stitute team has added a stage at the beginning which might be called 'preparation'. This is closely related to the 'active experimentation' stage and presents conceptual frameworks in which the concrete experiences might be better managed.

Resource demands

The claims to the success of OMD are very persuasive, but manager development has to be effective and fast in relation to other methods in order to justify the resource commitment. There are demands in terms of personnel, facilities, equipment and time. The right people have to be involved in the design and delivery of the programme. The key designers must have expertise in outdoor exercise design and in manager development. The consequences of inappropriate exercises (from either a safety or learning experience viewpoint) are too serious to be taken lightly. Group facilitators (those who work with small groups of participants, observing them and guiding their evaluation discussions) must have a thorough understanding of the processes involved and the way in which learning is heightened before, during and after the experience. Their part in reviewing exercises is of utmost importance and Mossman (1982) claims that the quality of review hinges on the skill and sensitivity of supervising staff.

Locations also have to be appropriately selected and equipment

must be safe. The time involved in setting up outdoor exercises is considerable. If maps are used, references have to be checked meticulously and visits to locations have to take place to ensure everything is in order. The designer also has to decide on the appropriate level of difficulty of the exercise. If it is too simple, total success can yield little learning, whereas if it is impossibly difficult, participants can become so demoralised that they are not willing to learn in the review sessions.

Effects on managerial practice

The key to the success of OMD lies in its effectiveness in fulfilling chosen objectives in terms of improved performance in the workplace, although it has to be said that this transaction is difficult to substantiate. Nevertheless, those providers and clients who have had an extended association with the method claim intuitively that it works and that it has a considerable effect on the workplace. In the absence of any proven linkage, OMD practitioners have opted for a review and reflection process which attempts to transpose learning on the programme to the work setting through 'intention'. The methods used have generally encompassed self-assessment, peer feedback, application of conceptual frameworks to illuminate simulated experiences and discussions to identify linkages between exercise experiences and those in the jobs. Some OMD exponents choose to enhance the last of these by using training staff from the client organisation to share the facilitator's role.

Wide interest in OMD

Because it is unique, it has attracted a great deal of attention from the media, particularly in countries like the UK where OMD is enjoying great financial success. "Such coverage however tends to focus on the physical aspects of various courses and consequently to feed the 'macho' mythology which has unfortunately begun to surround these programmes" (Beeby and Rathborn, 1983). This may be due in large part to the association of OMD with approaches like 'Outward Bound' and 'Adventure Education'. There are similarities but there are

also immense differences and in the interests of clarifying the focus of OMD for prospective participants, it may be worth drawing the distinction.

Outward Bound is a highly successful organisation started during the second world war and which pursues such worthy ideals as increasing young people's maturity, confidence and experience. It also promotes the notions of service to the community, a particularly worthwhile feature in the south-east Asian context. In many people's minds, it is still associated with early morning runs and a Spartan regime, connecting a healthy body with a healthy mind. Adventure Education, in which OMD has its roots, uses challenging outdoor pursuits with potential danger and a strong technical emphasis to offer deep personal and social awareness experiences. There is a substantially different emphasis in OMD; "Adventure is used as an educational vehicle ... in an effort to realise specific objectives ... in relation to the individual's personal development and the work situation" (Williams, 1980).

Because of this work-related emphasis, OMD can accommodate

managers of all ages, shapes and sizes, and programmes can be 'tailor made' for the client group's capabilities and learning objectives. In practical terms, this involves the designer meeting the client organisation to discuss the sorts of outcomes which are sought. This partnership approach can only enhance the potential benefits of such programmes by ensuring that objectives are appropriately directed and significantly real to the organisation.

OMD with Singapore educationalists

Since late 1989, some innovative work has been taking place with educationalists in Singapore using the OMD approach. A group of management lecturers from the Institute of Education has been collaborating with clients such as the Ministry of Education in an attempt to improve senior management capabilities in the service. Managers, including principals, vice principals and heads of department, have been given the opportunity to develop skill in planning, decision making, teamwork and leadership using the method. The objectives of such programmes have mostly been directed at improving managerial per-

formance in the selected topic area. The reactions of participants have generally been favourable, and the limited research which has accompanied the programmes has indicated a deeper knowledge of strengths and weaknesses, and an increasing understanding at the end of the programmes of how improvement might be effected.

The limitations of such research are recognised and there is a strong case for extending the scope of investigation to performance in the workplace. The initial findings however are encouraging, and with organisations increasingly recognising the importance of providing development opportunities for their managers (both individually and corporately), it seems the outdoor experience, with its stimulating and productive immediacy, has a valuable part to play in this process.

References

- Beeby, J. & S. Rathborn (1983). "Development Training - Using the Outdoors in Management Development" *Management Education and Development*, 14, 1, 170-181.
- Creswick, C. & R. Williams (1979). *Using the Outdoors for Management Development and Team Building*, Food, Drink & Tobacco ITB, Gloucester.
- Kolb, D.A., M.I. Rubin and J.M. McIntyre (1971) *Organisational Psychology - An Experiential Approach*. Prentice Hall.
- Mossman, A. (1982) *Management Training for Real*, unpublished address to the 1982 Conference of the Institute of Personnel Management, Harrogate.
- Mossman, A. (1983). "Making Choices about the Use of the Outdoors in Manager and Management Development" *Management Education and Development*, 14, 3, 182-196.
- Williams, D.H. (1980) "Adventure with a Purpose" *The Training Officer*, October 1980, 259-261.

Kenneth Stott is a lecturer at the Nanyang Technological Institute, Singapore and is a leading exponent of Outdoor Management Development in the region.



Things always seem much easier on paper

RON BRANDT

On Leadership and Student Achievement: A Conversation with Richard Andrews

Gains and losses in students' test scores are directly related to teachers' perception of their principal's leadership.

We've known for a long time that good schools had good principals, but we didn't know what that really meant.

And now you do?

If we define the good principal as someone who provides instructional leadership for the school, yes. One of the reasons earlier researchers didn't discover as much as they might have was that they weren't asking the ones who supposedly were being led: the teachers. Our research has focused on teachers' perceptions of the leadership of their principals - and we've found some interesting things.

But how do you know the teachers' perceptions are accurate?

Because they correlate with incremental growth in student academic achievement.

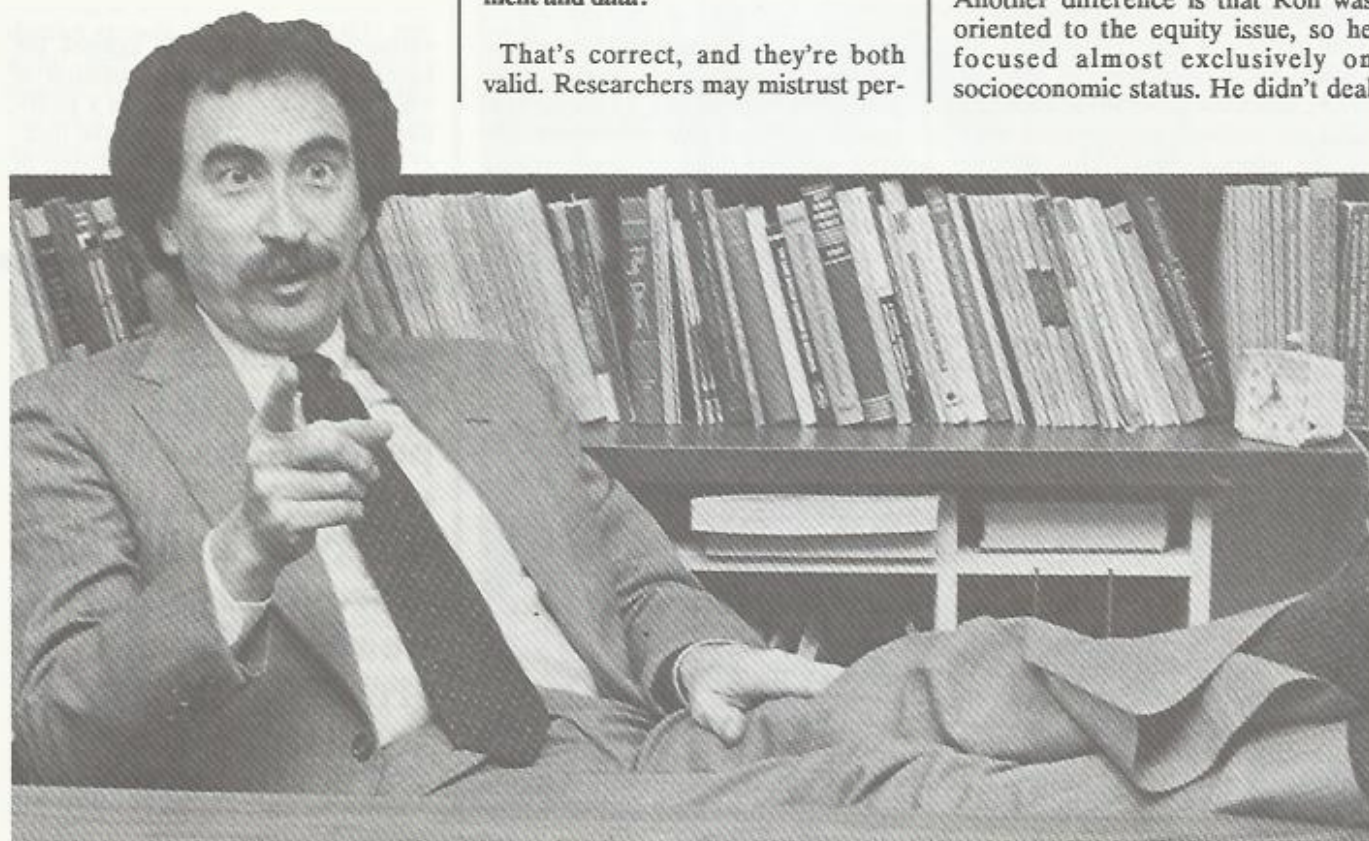
So you've got both professional judgment and data?

That's correct, and they're both valid. Researchers may mistrust per-

ceptions, but in a sense the only reality is perceived reality - and people's perceptions of their surroundings have a powerful influence on what they do.

How does your research relate to the literature on effective schools?

The foundation of our work is Ronald Edmonds' hypothesis that school characteristics are related to student achievement and that they can be observed *ex post facto*. Ron's work, of course, was mostly observational: first locate schools with high achievement, then look to see what you find in those schools that correlates with the achievement. We've gone about it by systematically gathering data from 100 schools over a three-year period, measuring the growth in achievement of individual kids within those schools. Another difference is that Ron was oriented to the equity issue, so he focused almost exclusively on socioeconomic status. He didn't deal



with black kids as such, for example.

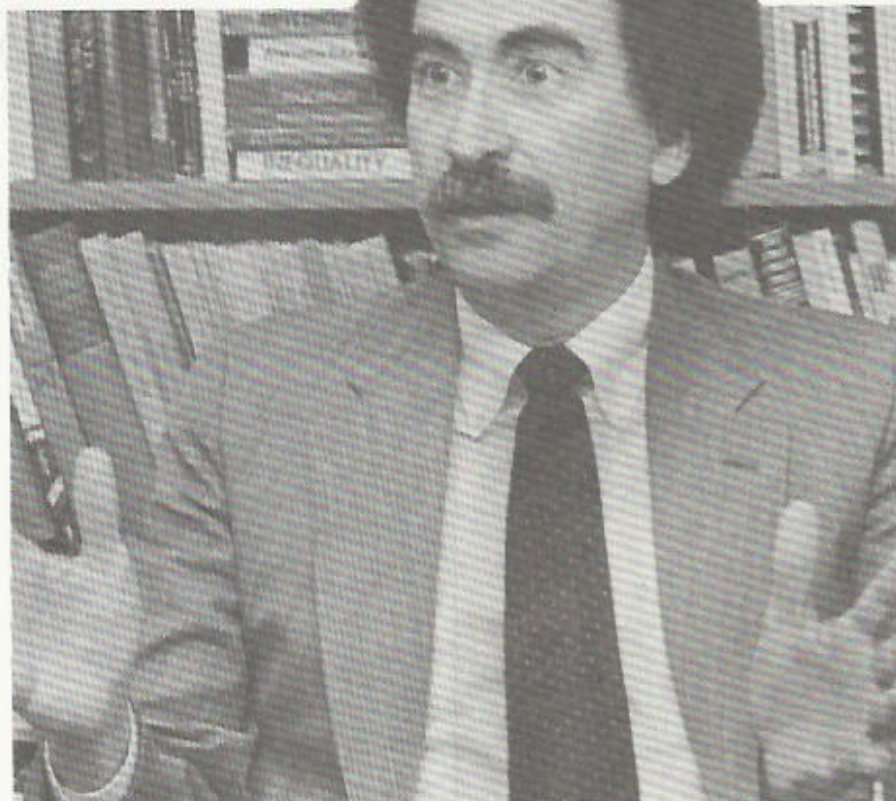
Our research includes both the socioeconomic and the ethnic factors - but it also goes beyond them to look at the incremental growth of all kids. We certainly want traditionally under-achieving kids to achieve at a faster rate than those who have traditionally achieved well, but we're also finding schools where students from *all* groups do better than they ordinarily would.

How is that related to principal leadership?

First I should explain that, based on teacher perceptions and other data, we have identified three different kinds of schools. One group, which we call "high profile" schools, have principals who in the perceptions of teachers are strong instructional leaders. According to teachers' reports, the schools are also characterized by having high expectations, frequent monitoring of student progress, a positive learning climate, and goal clarity. There's another group of schools where teachers say those things are not present. We call them "low profile" schools. The third group of schools is in between, or the average school.

When we first analyzed the achievement scores of the 100 schools, we found similar patterns in all of them. White kids were generally at about the 62nd percentile in mathematics, while on the average black kids were at about the 47th or 48th percentile. But when we analyzed their incremental growth two years later, we could see changes for students from both groups in both reading and mathematics. We plotted where each child had been in the spring of '82 and where he or she was in the spring of '84 - and we've done that in two succeeding years: spring of '83, spring of '85. If a student began at the 60th percentile in mathematics and if two years later his score was still at the 60th percentile, that was zero incremental growth. If it was at the 62nd percentile, that was two percentile points of incremental growth, which divided by two is one point per year. We did that for all kids within every ethnic and socioeconomic group in the school.

We found highly significantly differences in achievement between stu-



dents in high, average, and low profile schools. For example, in the high profile schools, the incremental growth for black kids' achievement in math was over three percentile points for the two-year period, while in the low profile schools they actually lost ground at nearly the same rate. White kids in the high profile schools were going forward at nearly one-and-a-half times what would ordinarily be expected, but in the low profile schools the white kids were going backward in mathematics just as the black kids were.

Your design seems unusual. Haven't most researchers tended to look at group, rather than individual, growth?

In general, yes. The one segment of education that has looked at incremental growth over specific time periods is special education. For a special education student, teachers gather baseline data and compare

subsequent evaluations against the baseline data. It's not a question of what other kids are doing; in a multi-handicapped child it may be the flicker of an eyelid that's the first step of incremental growth. I think general

We might say that where teachers have very positive perceptions of the quality of their workplace, they are more productive, so we see incremental growth in student achievement.

education needs to learn something from that.

In fact, the schools in your study probably don't keep their records that way.

They don't. As in most districts, they get back the average level of achievement; they get the number and percentage of kids in the upper three, middle three, and lower three stanines; they get normal curve equivalent scores on each student; but they do not get *incremental* growth scores.

Let's be clear about this. You are saying that in schools with strong instructional leadership, individual student scores go up over time.

That is correct. Remember that our characterization of these schools as "high profile" is based directly on teachers' perceptions of the quality of their workplace. We might say that where teachers have very positive perceptions of the quality of their workplace, they are more productive, so we see incremental growth in student achievement.

We might think that extraneous variables, such as whether the school building is new, old, or whether the district spends \$2,500 or \$4,000 per pupil, would be the primary determinant. Those things may play a part, but what is far more important is the quality of the relationships with other human beings in that environment. And since the principal is in the best position to influence that, we would expect his or her leadership to be an important variable, and sure enough it is.

Would you explain how you assessed teachers' perceptions of their principals?

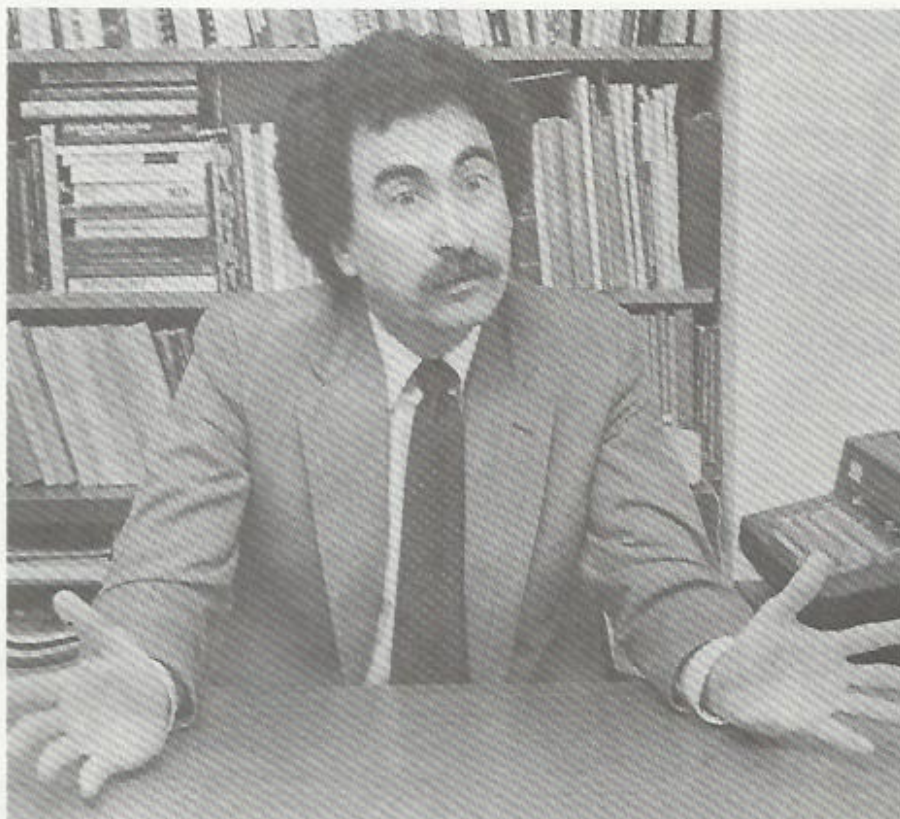
We began with an effective schools questionnaire that measures nine characteristics of the school. We asked collaborative teams of practicing teachers, principals, and college professors at the University of Washington to read the literature on a particular characteristic, such as strong leadership. Then we asked them, from their experience in schools and from the literature, to generate a

measure; we didn't tell them how. We did a factor analysis on all the items they came up with. We ended up with 96 items, of which 18 measure the instructional leadership of the principal (see sidebar). We have field-tested those items in urban, suburban, and rural districts and found them to be extremely consistent and reliable. For example, with 125 teachers rating 61 principals in the spring of 1984 and then a year later, the test-retest reliability for the strong leader factor was .72, so we're dealing with very stable perceptions in the minds of teachers, concerning the leadership of the principal.

What do these items deal with? What is it that teachers perceive as instructional leadership?

I can even tell you what teachers consider highest priority because we've identified 21 outstanding principals through a triangulation process - that is, they not only score high in teachers' perceptions, but they're also regarded as leaders by their peers and by their superintendents. We've then gone to the teachers who work with those principals and asked them to select from our 18 items the characteristics that

One of the reasons earlier researchers didn't discover as much as they might have was that they weren't asking the ones who supposedly were being led: the teachers. Our research has focused on teachers' perceptions of the leadership of their principals - and we've found some interesting things.



Having visited all these principals, having been in their schools, I can say without qualification that whenever the spark of leadership emerges within their teachers they see it and nurture it.

are most important and state why. The results surprised me.

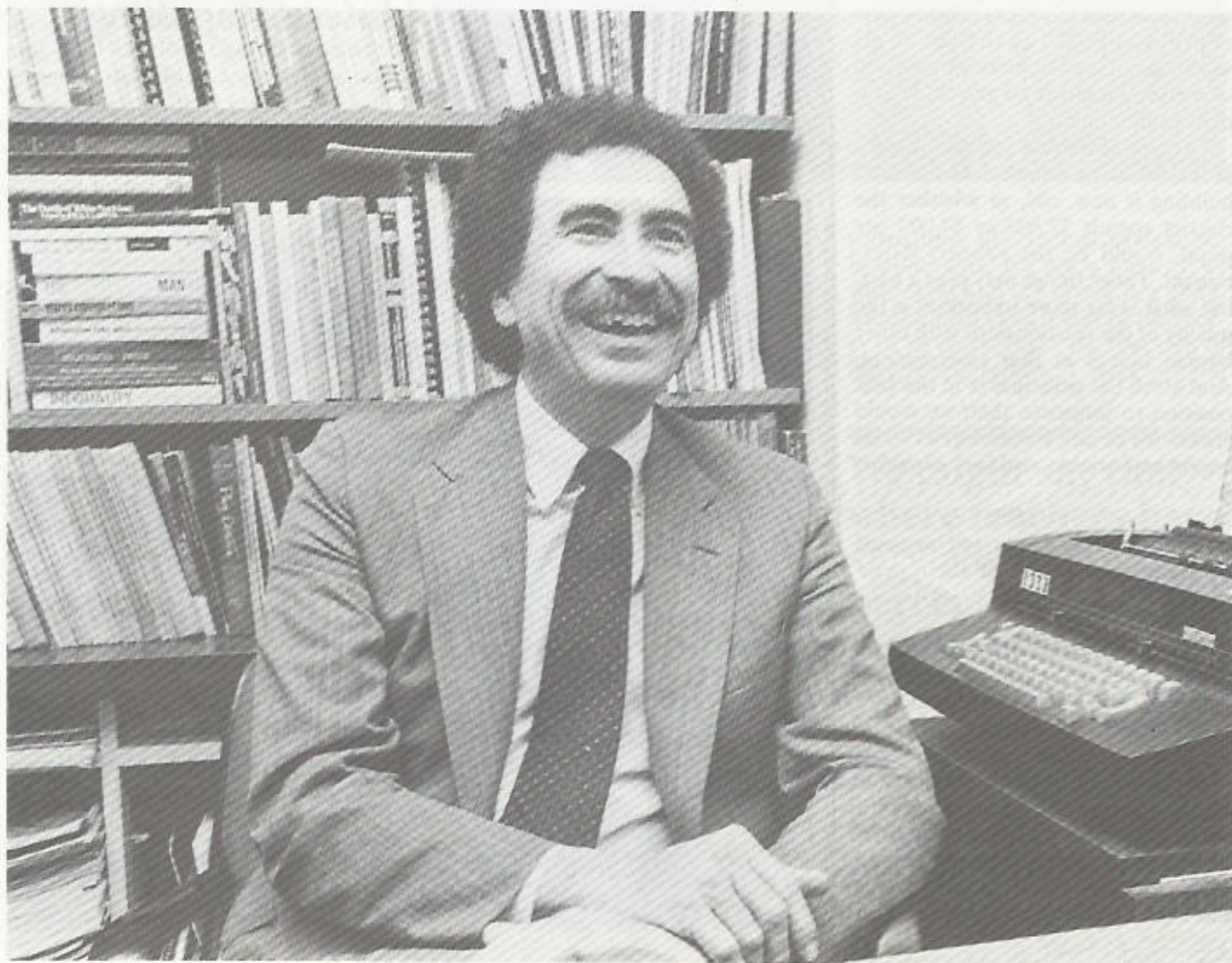
First is being a visible presence in the school. Now, that is contrary to what to what has been found in exemplary studies such as John Goodlad's Study of Schooling. The conclusion from these studies has been that in the typical school, teachers don't want their principal in the classroom. I think this shows the difference between the typical school and schools with principals who are exceptionally strong instructional leaders. In these schools, 78 percent of the teachers say they go to the principal with instructional matters or concerns. They seek these principals out; they want them in their classrooms.

The second most important thing their principals do, according to these teachers, is set a vision for their school. These principals don't sit around waiting for someone to tell them what their

school is supposed to do; they have a definite idea about the purpose of their school.

And they get the resources to help their teachers deliver. Teachers tell us that when they go to their principal with an idea, he or she knows about the resources, is well versed in the literature, and knows people who can provide staff assistance and development. The principal's response is, "That's a good idea. I've heard about a program," or "I know so and so. I'll put you in touch with her. We'll find a way for you to do that." One thing these principals do is arrange for their staff members to be staff developers for others in their school.

How can one individual - even the appointed leader - have so much influence? One of the criticism of early effective schools research was that other factors might not have been taken into con-



sideration. Maybe in certain schools circumstances permitted the principal to be a leader while in others, the school may make the leader rather than the leader making the school.

We have schools that are good even though they don't have a principal who is a strong instructional leader; however, we do not have any which have attained excellence. One school, for example, has such a strong staff that it has in the last four years spawned three principals: teachers who have gone on to become principals in other schools. And all three have close to being strong instructional leaders in their first one or two years as principal in a new school, which is tough to attain. We're talking about a very potent group of teachers - but the school was unable to become a high profile school until it was assigned a principal whom the teachers perceived was an instructional leader.

We have some examples where a principal is regarded as a strong instructional leader, moves to another school, and in two consecutive measurements is reported as a strong instructional leader by the teachers in the new school: the school moves into the high profile category. That tells me not that the principal makes the school, but that the school was unable to achieve excellence without that kind of principal.

By "strong leader," are you implying an autocratic style?

Not at all. The leaders we're talking about know how to empower people and yell, "Charge." They are both generals and sheepherders. The ones I call sheepherders collect around them a group of people that is in some ways like a shepherd and his dogs. I don't mean to imply that teachers are sheep or that the principal trains the dogs and call the shots - it's not a perfect metaphor - but there's a team that works closely together that "guides" the rest of the staff. In my analogy, the dogs do much of the work of keeping the whole group together and moving in the same direction, but the shepherd is crucial to the process. The principal has to be the keeper of the dream and shepherd, if you will, the direction.

Now, in the case of the new principal

who made such a difference, if you talk to teachers in the school, some will say that the new principal didn't do anything; they did it all themselves. Others, though, will say they were trying to do it themselves before, but they couldn't pull it off. What was needed was for the right principal to provide that facilitative force.

Some researchers - I think of Russell Gersten and Doug Carnine - contend that while schools do need instructional leadership, it doesn't necessarily have to be provided by the principal. Some people are good at getting others to do what they're not good at. I guess you're saying that in itself is a form of leadership?

The point is that the principal who simply sits back and says, "Okay, I'll let you do it" is not providing leadership. That's a leadership vacuum the teachers are having to fill.

How about the notion advanced by Albert Shanker and others that schools should be run by lead teachers rather than by principals?

I think that unfortunately Mr Shanker is arguing from circumstances rather than from ideals. As near as I can determine from listening to him, his position has been arrived at strictly from a monetary standpoint. He says we can't afford to increase every teacher's salary by \$10-20,000 a year, so we're going to have to increase teachers' salaries selectively. To get around the merit pay issue, he would increase the responsibility of some teachers, call them lead teachers, and pay them for the increased responsibility. Well, it's a nice idea, but if teachers' perceptions of the quality of principal leadership is the single greatest predictor of incremental growth in student achievement, that approach could depress student achievement for the sake of increasing a few teachers' salaries.

But of course you're talking about the way schools are organized now. A different model could work quite differently.

Yes, there's the hospital model, for example. You know: you have the administrator, and then you have the professionals who make the profes-

We found highly significantly differences in achievement between students in high, average, and low profile schools. For example, in the high profile schools, the incremental growth for black kids' achievement in math was over three percentile points for the two-year period, while in the low profile schools they actually lost ground at nearly the same rate.

Dimensions of Instructional Leadership

		Percentage of Teachers Who Strongly Agree or Agree		
		Strong Leader	Average Leader	Weak Leader
RESOURCE PROVIDER				
1.1	Promotes staff development activities for teachers	95%	68%	41%
1.2	Is knowledgeable about instructional resources	90%	54%	33%
1.3	Mobilizes resources and district support to help achieve academic goals	90%	52%	33%
1.4	Is considered an important instructional resource person in the school	79%	35%	8%
INSTRUCTIONAL RESOURCE				
2.1	Encourages the use of different instructional strategies	89%	78%	75%
2.2	Is sought out by teachers who have instructional concerns or problems	72%	47%	25%
2.3	Evaluation of performance helps to improve teaching	78%	46%	17%
2.4	Assists faculty in interpreting test results	54%	35%	9%
COMMUNICATOR				
3.1	Improved instructional practice results from discussion with the principal	80%	49%	25%
3.2	Leads formal discussions concerning instruction and student achievement	85%	41%	17%
3.3	Uses clearly communicated criteria for judging staff performance	90%	63%	17%
3.4	Provides a clear vision of what the school is all about	90%	49%	17%
3.5	Communicates clearly to the staff regarding instructional matters	92%	50%	17%
3.6	Provides frequent feedback to teachers regarding classroom performance	68%	29%	18%
VISIBLE PRESENCE				
4.1	Makes frequent classroom observations	72%	31%	17%
4.2	Is accessible to discuss matters dealing with instruction	94%	68%	66%
4.3	Is a "visible presence" in the building to both staff and students	93%	75%	46%
4.4	Is an active participant in staff development	97%	64%	50%

Above are 18 statements on which teachers rate their principals as instructional leaders. These statements are randomly distributed among 78 other items on the effective schools instrument used to measure teachers' perceptions of positive learning climate, staff dedication, early identification of student learning problems, frequent monitoring of student progress, high expectations, multicultural education, sex equity, and curriculum continuity.

To obtain the complete instrument, technical and administration manuals, and a sample data set, send a check for \$25.00 made out to the University of Washington to Mr Jerry Bamberg, Self-Assessment Study, M206 Miller Hall, DQ-12, University of Washington, Seattle, WA 98195.

sional decisions. But in that model, there is not just a leaderless group; there is a lead doctor. Well, in most schools we already have a person who can run the building; we call that person the head secretary. So let the head secretary run the management functions of the school and have the person who sits in the principal's chair be the lead teacher. The principals we see who are strong instructional leaders are already lead teachers. They have a keen understanding of curriculum and instruction, and they are respected for their ability to communicate at three different levels: one to one, in small groups, and beyond that to the district, the public, the educational community, and so on. I see no difference between that and the lead teacher concept.

Furthermore, we run the risk of creating a more bureaucratized form of governance and organization in elementary schools. High schools already have a problem because of their bureaucratic structure: the principal, assistant principals, department heads, teachers. Appointing lead teachers in elementary schools creates similar layers of bureaucracy that will diminish productivity and inhibit change.

Are you saying you are skeptical about the whole idea of differentiated levels of responsibility within the teaching profession?

Yes, I am convinced that we have to improve teachers' perceptions of the quality of their workplace, but I'm not convinced that the solution is to create lead teachers. Instead, let's create exemplary sites staffed by highly qualified professionals where teachers and principals from other schools can go for inservice training and development - where we put future teachers, and future principals, to do their internships.

Let me ask about it a different way. Does leadership by the principal prevent teachers from being leaders?

Quite the opposite. Having visited all these principals, having been in their schools, I am quite confident that whenever the spark of leadership emerges within their teachers they see it and nurture it. Ann Lieberman calls

it "Expanding the leadership team." I predict that when we get more good qualitative research, we'll find that strong instructional leaders expand teachers' roles in two ways: first by their leadership within their own classroom, which is their primary responsibility; and second, by using their creative ideas, their experience, and their enthusiasm to bring the larger organization to its ultimate level of efficacy.

Let's talk about how to use this research knowledge. Maybe we should start with how it's already being used.

One exemplary application is the Mercer Island, Washington, school district, where Wilma Smith, the superintendent, has implemented a clinical supervision model for principals. (See Smith and Andrews, pp. 34-37.) Clinical supervision of the principal means that the principal's supervisor does clinical observations of the principal in the school, the most important of which is clinically observing the principal at the same time the principal does a clinical observation of a teacher.

It sounds like an interesting program. How does it reflect your research?

The research identifies four sub-dimensions of leadership: principal as resource provider, instructional resource, communicator, and visible presence. The communicator category includes both creating the mission, or vision, of the school, and communicating clearly with teachers about classroom instruction. If a supervisor never observes the principal interacting at that level, the supervisor has no knowledge about the instructional leadership capability of the principal.

What are some other ways of using this research?

We're currently working with 64 school districts in the state of Washington who are using a self-study process we develop. The effective schools instruments are used to gather baseline data. Staff members at each school use these data to develop a three- to five-year school improvement plan and then use the instru-

ments again each year to get formative information about how they're doing. The instrument includes the 18 items that measure the instructional leadership of the principal.

Including perceptions of teachers?

That's right. In each of these 64 school districts the data are being fed directly back to the school. The principal sits down with the teachers to look at a profile showing the teachers' perceptions of his or her leadership, along with eight other effective schools characteristics.

That must make some principals pretty uneasy.

It does. It's interesting that many principals believe they are better instructional leaders than their followers think they are. The exciting thing for us is to see a principal - who has found out what teachers really think - get beyond that initial level of anxiety and say, "Okay, what am I gonna do?" Our first suggestion is to find out why the teachers feel that way: "They say you don't communicate criteria clearly in judging their performance. The only way to find out what that means is to go out to talk with all of them. If you don't want to talk with all of them, get the ones you feel most comfortable with and have a real heart-to-heart chat. When you've cataloged what they tell you, you've got your growth objectives. Later you go back and get feedback: "How am I doing?"

A self-help process like that isn't totally new, but it's unusual for it to be tied directly to student achievement. That's a good reason for principals to pay attention to it.

Yes, except that some are afraid that high profile schools may be preoccupied with student academic achievement: "Is it just thump, thump, thump, basic skills, basic skills?" Jerry Bamberg and I have been exploring that question, and we're finding that the answer is no. In regard to the four basic purpose of schooling, the high profile and low profile schools are much alike. They all say the first priority is basic skills; they all say the second goal is citizenship; the third is

Frankly, I never anticipated that we would find such a powerful relationship between leadership of the principal and student outcomes. After all, the principal is one step removed from the direct instruction process. But what we found is that the teachers' perception of their work environment is so important, the power of the principal's leadership so pervasive, that it has a measurable impact on student learning.

We have some examples where a principal is regarded as a strong instructional leader, moves to another school, and ... is reported as a strong instructional leader by the teachers in the new school ... That tells me ... that the school was unable to achieve excellence without that principal.

self-concept; and the fourth is meeting the individual needs of each child.

Beyond that, though, are differences in four important areas. One is higher-order thinking skills: nearly twice the number of staff members in high profile as in low profile schools say that's one of their goals. Another is learning to learn for life. And the third is academic excellence: not just recycling the basic skills but moving on to broader aspects of education. The fourth is a stronger commitment to multicultural education in high profile schools. The low profile schools are the ones preoccupied with basic skills because their students are not mastering them.

You say high profile schools want to go beyond basic skills to academic excellence, but your research is still based on standardized test scores.

That's correct.

Because you don't have any other accepted measures?

But also because we use the test scores differently. As I mentioned, we use residualized gain scores, and that's how we've found that instructional leadership is especially important for low-income and black students. If we look at students as a whole, the greatest single predictor of future achievement is prior achievement, but for black kids in our study schools the greatest predictor of future achievement is not prior achievement but strong leadership of the principal.

Suppose I'm a principal in Iowa or Arkansas. It's fine that you're doing all this in the state of Washington, but what can I do with what you've learned about leadership?

The first thing I'd suggest is to pick up the challenge that Ron Edmonds gave: disaggregate your student achievement data by ethnic group and socioeconomic status. Otherwise you can't know whether you have an effective school or not.

A second step is to start measuring incremental growth of individual students within each school, not across all schools. I don't care what measures

you use. If you say, "Basic skills aren't all that important to me," how about critical thinking skills? There are measures for that - measure it!

But how about feedback? How can principals find out about teachers' perception of their leadership?

Our instrument is not copyrighted; it was developed with state funds and by working with the public schools, particularly, the Seattle School District, so anyone can use it. If they want us to do the statistical analysis, we offer an assessment service for what it costs us to do it. But they can hand score it, if they wish. Let's improve schools; that's our objective.

Frankly, I never anticipated that we would find such a powerful relationship between leadership of the principal and student outcomes. After all, the principal is one step removed from the direct instruction process. But what we found is that the teachers' perception of their work environment is so important, the power of the principal's leadership so pervasive, that it has a measurable impact on student learning.

Richard L. Andrews is Chair, Policy, Governance, and Administration, University of Washington, College of Education, Seattle, WA 98195. **Ron Brandt** is ASCD's Executive Editor.

Reprinted with permission from Educational Leadership (Sep 87).

CARRIE KOJIMOTO

The Kid's-Eye View of Effective Principals

**When someone asks them, children
have a lot to say about effective - and
ineffective - principals.**

She goes in the cafeteria to see if everybody is doing right and not throwing trash on the floor and throwing milk on people's heads and putting food in people's shirts and pants. And she makes sure you have no animals, like lizards, in the trays running around.

- A third grade student discussing his principal.

Despite an increase in their responsibilities not directly related to children, school leaders are often engaged in one-on-one exchanges with students (1). This finding comes from an extensive study of principals conducted by the Far West Laboratory for Educational Research and Development. Through hundreds of hours of observations and interviews conducted in 12 schools, we saw first-hand the kind of juggling act principals perform as they handle many pressures and demands from their district offices, communities, and staffs. As part of the same study, we queried 107 students to obtain their perceptions of their principals.

Although children have received little attention in educational research literature, their comments in this instance are highly descriptive and sometimes insightful about the principal's role. The principals whom students find to be helpful:

- create and maintain a safe and orderly environment;

- enhance students' self-esteem, sense of responsibility, and ability to get along with others; and

- help students grow academically.

Looking at what students have to say about principals can help educators understand what children's needs are and how those needs can be effectively

met at the school level.

The Interviews

To obtain a representative sample of each student population, we asked principals to consider the gender, ethnicity, and grade level of the students they recommended for the interviews. In addition, we asked them to choose students who represented each of five participation-style categories:



Said one sixth-grader about her principal: "She's not in her office like some principals are. She just gets around."

Looking at what students have to say about principals can help educators understand what children's needs are and how those needs can be effectively met at the school level.

academic, social, rebellious, dependent, and isolated (2).

With both parents' and teachers' approval, we asked students to describe what their principal did, their personal interactions with the principal, and what a "perfect" principal would do. We also asked them to compare former principals to their current one. We posed the questions in various ways and in different orders depending on the student's age (3). The following is based on the comments of 37 elementary school students.

The Importance of High Visibility

When asked "what does your principal do?" students in all schools reported seeing their principal walking in the halls, on the playground, and in the lunchroom; talking to teachers and students; and visiting classrooms. In other words, these principals constantly "cruise" the school and do not conduct business just from behind their office desks. An "academic" sixth-grader spoke of his principal:

She just comes around the school and sees what we're doing and stuff, or she goes out on the playground and sees how we are playing. She's around; she's not always in her office like some principals are. She just gets around.

Students generally gave high marks to principals for maintaining this kind of high visibility. Circulating frequently connotes to youngsters that the principal knows what is going on in the school generally and is interested in what students are doing specifically.

Principals who "hide out in their offices," on the other hand, were characterized as unfriendly, lazy, and uninterested. For example, students made these criticisms:

At some of the places I went, the principals didn't really talk to the kids; they just kept to themselves and stayed [in their offices].

We didn't have assemblies with [the other principal]. She'd have one of the office attendants have the assemblies, and she wouldn't come in herself. She'd never show her face. She never walks around to the classroom or nothing.

In addition to emphasizing the im-

portance of highly visible principals, the students also discussed the need for safety and order, social requirements, and personal and academic guidance needs. In the following sections, we discuss those three types of needs and illustrate how students felt that active principals met them.

Meeting Needs for Safety and Order

The "cop assigned to a beat" is one image active principals projected to youngsters. When kids saw their principal "cruise", they reported that the principal was making sure that they obeyed the rules, got to classes on time, and didn't get into fights or damage the school grounds and buildings. For example, several students described their principals' routine behaviors in the following ways:



Students recalled situations where a principal offered advice about classwork while making rounds on the playground.



Children appreciate when principals "cruise" the playground, stopping to chat and play.

I see him outside sometimes, during the winter, trying to make sure that boys and girls don't throw snowballs at other people.

She looks out the windows to see kids don't go out in the desert, because long ago, I think Tuesday a long time ago, we saw a big bull snake. And she doesn't want us to go on the desert anymore. She helped us learn about not throwing rocks and not going out on the desert catching horny toads, cuz there's a lot of snakes.

When she's in the auditorium, she's talking to us, having a meeting. When she's in the classroom, she's announcing something or checking on us, talking to our teachers. When she's out on the playground, she's watching us making sure everything is okay.

Student observations correspond with those made by field researchers who noted principals reprimanding students for making noise and running in the hallways and who described principals maintaining the cleanliness of the school yards and cafeteria. Although a few rebellious youngsters viewed the principal's supervision as an obstacle, most students regarded the seemingly constant presence as reassuring.

Meeting Social Needs

In discussing what principals did as they "cruised" that made them not only visible but accessible, youngsters pointed out that safety and order were not the principal's only concerns. Qualities that further distinguished a "good" principal in their minds were what one youngster described as "nice" and "caring." Another student, a rebellious one, commented:

She'd be everywhere, in the halls and classrooms. She really didn't spend very much in the office with conferences and stuff. She really took her time on kids, and she didn't take advantage of us.

Either in discussing their own principal or in envisioning a "perfect" one, students preferred a principal who tried to learn about and meet their needs and develop positive relationships with them. Kids from all sites emphasized the importance to them of face-to-face, one-to-one exchanges, beyond mainly group-directed monitoring acts discussed. According to students, effective principals per-

[The children] expressed a clear preference for principals who counsel and mediate, who actually listen to the kids' ideas and evaluate that information before meting out punishments.

formed three types of activities that met their social needs.

1. *Hi-bye/passing time with students.* When asked "Have you ever talked to the principal?" many students recalled "conversations" during which the principal said "hi" and "bye" and the child returned the greeting. This simple act, accompanied by a smile, is apparently very important to students. Children felt recognized as people, as their comments illustrate:

When I say hi to people, I like them to respond back. When I say hi to [the current principal], she says hi. But when I said hi to [my former principal], she just looked at me and rolled her eyes the other way, so I just walked away.

[The principal] always says hi and she smiles. I like her so much when she does that. It makes you feel like she knows what she's doing and knows who you are.

Hi-byes, then, let students know that their principal recognized their existence. They were particularly cherished by children typified as isolated. The following comment by a fifth-grader demonstrates their importance, "She helped me by saying hello because I don't have many friends."

Principals who took the time to engage in brief, informal chit-chat and acknowledge students' birthdays also made favourable impressions on children. Said one fourth-grade social student:

He was a very good principal. He liked to play with the kids, like more than just talk or just say a couple of things, and everybody knew him. He had a thing like he'd pick you up and twirl you around, and he'd always remember your name and stuff.

A sixth-grader, categorized as isolated, doubted whether the principal knew her name. She recalled that in kindergarten, the other principal "came to class and talked to us individually, so I felt I knew him."

2. *Counseling students about social behavior.* Principals who took the time to project a friendly and concerned demeanor made a difference to kids. Students emphasized the value of the principal acting as a counselor, attending to their emotional or

psychological needs. Youngsters felt more comfortable approaching them with their social concerns or problems. For example, one girl, a social fifth-grader, described her principal as a "nice uncle." She elaborated with this comment:

If there's a problem during school and it's involving your social life and it's bothering you, like your friends don't like you for some reason anymore, he'll talk to you and try and work it out.

The principal who used a counseling approach was particularly important to dependent or isolated kids. For example, a dependent child in an urban school admitted some of his conversations with the principal stemmed from the fact that he got into fights with other kids. He considered these talks helpful because:

She's helped me to understand the problems of the other people, and she told me that other people don't understand your problems. You got to try to understand them. You got to really try hard.

Another student who felt "the whole school relationship was not that high" offered this suggestion:

I would really like our school to have a counselor. Because ... we have a lot of kids here at our school that I know have records. And they probably have family problems and ... they need somebody to talk to ... And I think if kids know that they had somebody to talk to about school or their teachers or their punishment or how they're feeling or their parents or their friends, or anything like that, I think there should be somebody that they can come to.

This dependent sixth-grader did not expect the principal to fulfill that role, but she felt that someone providing counseling and personal guidance would improve her school.

3. *Mediating and governing disciplinary matters.* Resolving disciplinary problems is such a common activity for principals that students immediately assumed they'd done something wrong when the principal sent for them. Likewise, many principals complained that most of the youngsters they came into contact with were those



Remembering how the principal had helped settle a fight, a student remarked that "she's a good problem solver."

who were sent to the office because they were in trouble.

However, children not only accepted that aspect of the principal's role, but also acknowledged its importance. They expressed a clear preference for principals who counsel and mediate, who actually listen to the kids' ideas and evaluate that information before meting out punishments. For example, a fourth-grader's appreciation for the way the principal listened to his explanation comes through in his recollection of a disciplinary office visit:

When I got in trouble once, cuz we were playing tetherball and I forgot I wasn't supposed to be out because I forgot one of my books. As I was out playing and she called me in. She called me in for this thing and talk to me cuz I got in trouble, and she asked me why I did all this stuff and all these questions [like] why I did it and when did I do it. She listened like she had 40 years. She was really interested in what you had to say. She wouldn't turn her head or if someone came in, she'd sort of ignore them just to listen to you.

Remembering how his principal had helped settle a fight, another student remarked that "she's a good problem solver,"

Last year, me and a sixth-grade girl got into a fight and she won. Well, it was actually my fault, but I was trying to, well, okay, we were calling all these sixth-grade girls these names, and we kept on calling them and then, finally, they got mad. And so this one girl, Cheryl, she came in, and she knocked me down, and I tried to get up. Everytime I'd get up, she'd knock me down. So we had to go to the principal's office. It wasn't that bad of a fight. I was just crying because I was mad. She didn't just say, "Don't ever do it again," or something mad. She just talked it out with them.

By contrast, students criticized principals who yelled at them or showed little desire to understand situations. They saw the importance of a principal being firm and consistent, but they were emphatic in their negative opinions when a principal was indifferent to their viewpoints or treated them unfairly.

Students expressed positive regard for principals who punished fairly and, on other occasions, had positive contact with them. The positive interactions reassured them that they were not disliked as persons. For example,

Students generally gave high marks to principals for maintaining ... high visibility. Circulating frequently connotes to youngsters that the principal knows what is going on in the school generally and is interested in what students are doing specifically.

a rebellious student looked as his previous year in school as his worst: "I'd get into trouble almost every day." But things are different under his new principal: "This year, I haven't got in trouble, you know, hardly at all." He attributed the change in part to how his new principal relates to him.

When I got into a fight, he would talk to both of us, and he'd find out what happened, and then he'd decide what he would do and most of the time, he just tells us, you know, to stay away from each other, or you know, stay on the bench. He doesn't get mad. He just, you know, talks normally. When he tells me to stay away and sometimes, when he tells me to do that, he helps - he does stuff with me. Like you know, we talk, tell jokes and stuff at recess.

Meeting Needs for Personal, Academic Guidance

Children praised principals who kept their schools safe, demonstrated concern for them personally, and were firm but fair in disciplinary matters.

But they also spoke highly of principals who contributed to their academic growth. When asked how principals had helped them learn or what an ideal principal would do, students described situations in which a principal became personally and directly involved in their learning.

Students also recalled situations during which a principal offered advice about matters related to instruction while making rounds of the school:

- *In the classroom:* "One thing I do like about [the principal] is that he does come in to observe the classroom. I really think that's good."
- *On the playground, during lunch or recess:* "I ask him to [help] with spelling, cuz I'm not a very good speller. So I ask him to like, you know, to help me spell words and with dates and stuff. If I need something, it's usually at recess, like after we had a spelling test, I spelled this way, I want to make sure it's right or something."
- *In the principal's office:* "He used to help me a lot. Like if I had trouble and my teacher didn't explain it too well. I'd go up there [to the principal's office], and I'd ask him, like with math and stuff like that and he'd help me."

When kids considered one principal more helpful than another, it was often because of the praise and compliments paid them in their academic pursuits.

[My other principal] would call some kids from the first grade and have 'em go in and read to him, and if you read really good, he'd give you a cookie. One of these big, gigantic chocolate chip cookies.

When I was smaller, in kindergarten, I used to think that schools were a bore, and then, I think it was first grade, [the principal] started saying, "You're doing much better in your work, Angela, the teachers tell me" and stuff like that, and I would think, "Ooooh." And then after he would go outside and [do] stuff with us, and I thought that was nice. He would make us feel better just to come to school. He didn't just [say that to] me, he did [that for] everybody.

Students also felt that the principal could improve instruction in their school by obtaining better books for the school library and offering advanced students a more challenging curriculum.

The Value of Principals' Actions

Students' perceptions about principals commonly referred to three kinds of impact that resulted from principals' activities: safety and order in the school, the potential for positive influence on their self-esteem, and assistance and encouragement for their academic growth. Students' comments, which rarely have been tapped, are useful because they can help practitioners understand youngsters' needs. Their remarks offer encouragement to harried school leaders by reaffirming the value and importance of principals' actions.

Notes

(1) See Ginny Lee, David Dwyer, Nikola Filby, Bruce Barnett, Bracha Alpert, Brian Rowan, and Carrie Kojimoto, *Understanding the Principals' Contribution to Instruction: Seven Principals, Seven Stories*. (San Francisco: Far West Laboratory for Educational Research and Development, 1985).

(2) We define the five participation-style categories of students as follows:

- *Academic students* are task oriented and cooperative in class; are not discipline problems.
- *Social students* value friendships more than school work; may create minor disciplinary problems through frequent interaction with class peers.
- *Rebellious students* are reluctant learners; may be very bright

When asked how principals had helped them learn or what an ideal principal would do, students described situations in which a principal became personally and directly involved in their learning.

or disadvantaged learners; frequently create disciplinary problems.

- *Dependent students* are task oriented; hope to please; are frequent hand-raisers who require constant teacher feedback; are frequently rejected by peers.
- *Isolated students* interact little with peers; rarely participate orally in class; are never discipline problems; tend to "fade into woodwork"; may be extraordinarily shy.

(3) For a full report on this procedure and others used in this field study, see David Dwyer, Ginny Lee, Bruce Barnett, Nikola Filby, and

Brian Rowan, *Methodology: A Companion Volume for the Instructional Management Program's Field Study of Principals*, available from Far West Laboratory for Educational Research and Development.

Author's note: I wish to thank David Dwyer and Barbara McEvoy for their helpful suggestions and support in preparing this article. This paper was supported in part by a contract from the National Institute of Education, Department of Education, under Contract No. 400-83-0003. The contents do not necessarily reflect the views or policies of the Department of Education or the National Institute of Education.

Carrie Kojimoto is Program Assistant, Far West Laboratory for Educational Research and Development, 1855 Folsom St., San Francisco, CA 94103.

Reprinted with permission from Educational Leadership (Sep 87).

Humour in Education

Teachers can exploit humorous situations to enhance teaching and learning

Freud, (1927), writing about humour said, "not everyone is capable of the humorous attitude. It is a rare and precious gift, and many people are even without the capacity to enjoy humorous pleasure that is presented to them". Few people today would agree with Freud that humour is a rare gift. The few psychoanalysts who have since written about humour, all agree that it is of great value and all hold it in high regard, but Freud worked mainly with "mentally" disturbed people and in normal people humour is not rare; it is enjoyed by all. The significance of humour to human behaviour is its close link with effective communication at a level beyond that of the direct, conscious and arguable. Humour leads, through the absurd, to constructive, creative thinking. It also tells us of our hidden or unconscious tendencies.

Many people can only deal consciously with their inner, secret fears when the absurdity in life's experiences can be expressed in humour. Humour also helps us to explore the absurd when we need new ideas. As de Bono (1982) pointed out, we need mechanisms to take us away from familiar well-worn paths of thought if we are to reach new conclusions. One of these mechanisms is humour. When we have laughed, we also see the sensible idea within the absurd. His example, asking - What would be the advantages in flying an aeroplane upside down when landing?, led a child to suggest that it would be advantageous for the pilot to be able to

see the ground just before wheel contact. Incidentally, when adults were asked the question no positive outcomes arose. For many years engineers have been designing cockpits. It took the absurd question to get a "new" idea which could be incorporated when adapted into normal aircraft.

At the end of his long paper "Pour une metapsychologie de l'humour", Bergeret (1973) points out that the more intense emotional states in patients are seldom resolved through humour. Frequently, one finds that it is when something is ESSENTIALLY important to the person's self that it is too risky, even too dangerous, to make jokes about it. If the way I perceive

myself is seriously challenged I will tend to defend rather than examine the challenge. We suffer, we tolerate our position, even when to do so is illogical. To question ourselves by asking questions that appear absurd is to beg for ridicule. To do so needs relationships with others that are supportive not destructive.

Classroom Humour

Teaching within one's home allows a certain type of humour to pervade the social relationships among family members. Teaching someone else's children, or other adults, places the teacher in a position of vulnerability, contrasting strongly with his accepted,



Humour leads, through the absurd, to constructive, creative thinking

elevated position of responsibility. Paraphrasing Heimann (1950) we might propose that teachers feel guilty when they become conscious of personal feelings towards their students. Consequently, they aim at becoming completely unfeeling and "detached", so avoiding any emotional response.

Trying to trace the origin of the idea of a detached teacher has been difficult. There may be some reported research in the literature but I haven't found it. The notion that a good teacher remains emotionally detached, restrained and competently in charge is, however, one that persists. It is held, perhaps most strongly, by students and parents.

It is difficult to imagine, during the course of continuing teacher-student relationships, that some situations, however rare, do not arise which stimulate humour and prompt smiles and even laughs in both teacher and students. Teachers, however, seem to feel more at ease when helping students with closed, impersonal problems and technical difficulties. Humour distracts from the sequence of information being presented by the teacher. They fail to share humour, and hence, fail to go beyond the overt emotional states in students. It is almost as if they are afraid that pleasure will produce a class with uncontrollable manic excitement with which the teacher has colluded. Quiet, well controlled classes are prized; noisy,

excited, motivated classes are frowned upon. It seems that teachers are afraid that humour will divert them from the task of teaching and being seen to be competent teachers.

They have no difficulty recounting to colleagues the problems, even disasters that occur in classes but become overtaken by shyness as soon as they feel the wish to say that a particular student made them or the class smile. Perhaps even more so if one of the students exhibits personal attraction implying more than a safe teacher-student relationship. Is a class in which students laugh and smile with the teacher proper and respectable? Cannot the teacher use humour to bring emotional absurdity into consciousness and so deal with it?

On the other hand, the modern, well-trained teacher rather than trying to avoid emotion in the class, pays a great deal of attention to the feelings of students. Teachers are becoming more and more aware of their own feelings that develop within the classroom which are communicated to and by students.

Humour's Paradox

It is important to distinguish between wit and humour. Wit always has an element of aggression in it. Humour is the recognition of the absurdities experienced in life and always has a part directed at self. Paradoxically, humour is a very serious matter. As Grotjahn (1987) points out, "wit is related to sadistic aggression. Humour is related to the acceptance of human suffering and melancholia. Humour does not lead to loud laughter, but to the sad smile of the great clown." All "good" humour is directed against the self, it turns insult into victory, for the secret of masochism is "victory by defeat", (Reik, 1941). Humour, as a silent acceptance of suffering, is essential to human existence. It is present to a degree in most of the stories passed from person to person.

The Humour in Failure

Failure and then learning from mistakes is a normal experience. While trying our best, we still fail. It is important, then, for a student to learn to cope with the suffering of failure if learning is to continue. When the suf-

fering is denied or repressed, a student will begin to learn less and less effectively. If more work is placed on such a student, it only increases resistance to succeed. Soon the student will be overwhelmed, so confirming his failure. As a failure there is nothing the student will do to improve. He is confirmed in his own state.

It is interesting, perhaps, to note the large number of modern texts on teaching methods which advocate positive rather than negative feedback to students. This is in itself a good direction with plenty of research evidence to support it. However, if this is allowed by teachers to permit them to avoid the task of dealing with deeper emotion then the teacher fails too.

The teacher can only succeed by becoming aware of the moment when absurdity occurs and allow an image to form in the mind, even though the image may appear to be irrelevant. The image that is conjured up in the mind, the image which makes us laugh or smile if we are free to catch it, is a precious portrait of a difficult situation in which we are painfully stuck. Only if we can laugh at the seriousness with its paradoxical elements can we reach a deeper level of understanding. To try to do it out of time or context is hard work. It lives only in the moment. It has its impact for the student only then. We know when we have exchanged a meaningful communication by the joy of expression that comes

It seems that teachers are afraid that humour will divert them from the task of teaching and being seen to be competent teachers

within that instant of time, that moment of understanding at a deeper level.

To recreate a situation that has been missed is almost impossible. The empathy that exists between the teacher and pupil is an ephemeral quantity. Once it has slipped by, the next opportunity will not be the same; humour and deep communication are infrequently juxtaposed. This implies that the relationship between teacher and student must be unobstructed. The teacher must not be embarrassed, the student should be free to accept. As Bion (1967) wrote, "This is the crux of the situation, the more unobstructed the relationship ... the more subtle it is."

It follows that humour cannot be planned. Farce and wit may be planned and introduced into the lecture, talk or conversation in a class but humour is the product of the moment. Thus, the teacher who sets out to amuse the class takes on the role of the buffoon. The effect is not the same. What is remembered from wit or farce is not understanding but the event which produced it. The interchange that produces humour is seldom remembered, because the satisfying closure of some problem has been effected.

Pasquali (1986) suggested an analogy with dreams. He proposed that it is the satisfying dream that cannot be remembered because it is the one which effects closure of a problem. He goes on to enlarge the analogy by saying "...as dreams are the representation through images of the never ending multitude of events in the internal world, similarly humour is the transformation in images of affects (emotions) and fantasies." An example of this might be:

A student begins to attack me by saying: "You didn't allow us enough time to prepare a good report so no matter how hard we work, we can only expect criticism."

I respond by saying, "Time for students is something they must learn to manage. Anyone can produce a good report if they have enough time, the skill I am looking for is a good report in a short time."

"This is not fair," someone says, "Whatever we do, you simply go on reducing the time." This last attack provokes in me a vision of a lizard.

I say, "At this moment in time I am thinking of a lizard who when his tail is chopped off simply grows another, and, each time the tail is stronger than before." They all laugh. We are all able to see our own absurdity. I tell them that next time we will agree a reasonable time for the report.

What underlies such a scenario are the teacher's desire and need to produce "better" students and the students' needs and desires to meet the challenges made by the teacher. In both, their desired feelings were being frustrated. The students thought they were being unfairly treated. The teacher thought the students had given up trying to be better students. At the same time, they want to share a comfortable relationship, but, returning to the previously experienced comfortable relationship without removing the present problem is impossible for both. Humour assisted the process. Without humour, the conflict, I suspect, would have remained. At the very least it would have destroyed the previously enjoyable relationship. They might have accepted the "rule of authority" - this is the way it will be done! But emotionally they would

We know when we have exchanged a meaningful communication by the joy of expression that comes within that instant of time, that moment of understanding at a deeper level

have distanced themselves from the teacher, making further effective communication difficult if not impossible. Learning would have regressed to "learning by order"; what you give us we will learn. The resolution through humour enabled both the teacher and the students to gain eminently satisfying resolutions whilst maintaining their good working relationship.

Aren't we all absurd, really?

Humour and absurdity go together. Not the absurdity of the comic strip but the illogical absurdity of our personal needs. Children all go through a stage of development where they confront absurdity by making fun of situations (Wolfenstein, 1950). They deal with the deepest and most distressing feelings through play: death, illness, loss, aloneness, insecurity, impotence, incompetence, and continuing change, and come to terms with them. As we enter adulthood there is an inherent assumption that adults, particularly teachers, are never absurd.

Fear of many things - loss of face, physical hurt, illness, even death - is always with us. Yet, despite this knowledge, anxiety about the continuity and security of self persists, even into old age. Children can deal with such fears and anxieties by accepting that life is theirs. They play at being immortal while accepting their vulnerability. "You're dead" in a child's game is simply a way in which the notion of the fearfulness of death is brought into consciousness without having to be dead. The notion can be examined. Yet adults, fully endowed with these tools are not able to play as children. By not searching for the moments of absurdity, the moments of humour in life, by being perpetually serious, they allow illogical decisions, fears and anxieties to perpetuate.

Avoidance is the way many people deal with continuing fears and intense anxiety. Legends and myths are another way adults deal with these personal fears. Invoking a God who interferes in our life is another. Some experiences hit at the very centre of self-identity, but by avoidance strategies we can perpetuate our own fantasies and myths and go on as before. The consequences, however, are to deny change for the better.

For many adults, including teachers,

humour is something they get from others. They are afraid to see the humour in their own life. They attempt at all times to be logical, to have safe ideas. So they fail to see the illogical parts and because all illogical statements are absurd, they miss the humour in the moment.

In some societies, to confront absurdity directly is often impossible. To raise daring political questions, or questions relating to beliefs or faiths, or even to get a person to change something significant to self (e.g. admitting a lie) can only be done by presenting the absurdity inherent in the situation in the form of humour. Some of the cartoons in daily papers set out to do just this. In education, a typical absurdity perpetuated by a student is to believe everything said by a teacher. There is no guarantee given with a teaching diploma or a subject degree that the person holding them will always speak only the truth, the whole truth and nothing but the truth. Yet students and parents continue to accept unchecked what teachers tell them. Similarly, students seldom cross check "facts" contained in textbooks but repeat them without question. Often teachers will mark something wrong because the argument is wrong or illogical. The conclusion can still be correct even if the argument is wrong. Is there not humour in that too? The

As teachers we should strive to make learning as fascinating as it is for pre-school children

teacher perpetuates the myth of only having a right conclusion when the argument is right by failing to see the absurdity in their own position.

Learners have problems too

Learning can become, and for some is, a full-time task. The learner must follow his motivated direction of exploration to an end point. To stop deprives him of the enjoyment of learning. When, however, the direction and speed of learning is under the control of others, the process can become frustrating and often overwhelming. Ceasing to learn is a simple way out of the dilemma. Every excuse will be found not to study, eventually not to read, and not to listen. The person grows to rely solely upon personal experience and messages from those that are "trusted" and this information then goes unchallenged.

Persecutory anxiety in facing overwhelming demands is a common state among students, much more common than many would believe. Yet we, the teachers, persist in perpetuating massive syllabuses and out of date testing systems (examinations) demanding memory rather than understanding. As teachers we should strive to make learning as fascinating as it is for pre-school children. As Carl Rogers (1967) so strongly pointed out, the overwhelming action upon children by the education system, as currently presented throughout most "advanced" countries of the world, destroys their restless, spontaneous, ceaseless curiosity - Why?, How?, When?.... Tell me about.... It imposes syllabuses and timetables to which all must adhere.

I have a vision of a large number of students crushed by a huge pile of books, examination papers, and timetables on top of which are a committee of teachers and politicians adding more and more to the pile. They are shouting to the world, "Look!....Our students are the best. They are truly excellent". Some little distance away is a small group of children talking to one another. One is saying "Didn't you know there is nothing written in that pile of books and papers? The words have all been taken out by the teachers."

References

- Bergeret, J. (1973) "Pour une Métapsychologie de l'humour", *Rev. Franc. Psychoanal.* 37: 539-565
- de Bono, E. (1982) *de Bono's Thinking Course*, BBC Eng. Ariel Books
- Freud, S. (1905) *Jokes and their relationship to the unconscious*, New York, Norton
- Grotjahn, M. (1957) *Beyond Laughter*, New York, McGraw-Hill
- Grotjahn, M. (1987) "Dynamics of Jewish Jokes", *Am. Behav. Scientist* 30:96-99
- Heimann, P. (1950) "On countertransference", *Int. J. Psychoanal.* 31:81-84
- Pasquali, G. (1986) "Some notes on humour in psychoanalysis" *Int. Rev. Psycho-Anal* 14: 231-236
- Reik, R. (1941) *Masochism in Modern Man*, New York, Straus, Giroux
- Rogers, C. (1967) *Freedom to Learn*, C E Merrill Publ.
- Wolfenstein, M. (1950) "A phase in the development of children's sense of humour", *Psychoanal. Study Child*, 6:336-350

PF Millington is Senior Educational Development Officer, Educational Development Centre, Ngee Ann Polytechnic

Diagnosis of Pupil Weaknesses in English Language Skills Through an Analysis of Cloze Passages

Teachers of Yuhua Secondary School generally feel that remedial lessons for weaker pupils were necessary to improve their performance in the various subjects. However English language teachers found it very difficult to identify specific areas where pupils are weak in. Their general informal observations of pupils' performance and written work by pupils were their only sources of data on pupil weaknesses.

At a departmental meeting, some English language teachers expressed a desire to learn how to make use of cloze passages for further insight into the English language ability of their pupils. The cloze passage is a common item in English language tests and is also used to measure the reading level of pupils. As test data on cloze passages were readily available, teachers could analyse them in order to obtain

information on pupil weaknesses and to plan remediation and classroom teaching accordingly.

Our approach was very simple. The individual responses of pupils to 11 cloze passages used in Sec 1 and 2 Express and Sec 1 to 3 Normal Mid-year Examination papers for English language were recorded and class scores computed. We also compute the percentage of correct responses for each passage as well as the percentage of pupils giving correct responses to individual items. All acceptable answers were considered as correct, as the 'exact-word' method "does not seem to reflect the student's language competence as well as the information yielded by the acceptable-word method" (Hinofotis, 1980). Items where pupils had difficulty with were highlighted and possible obstacles faced by pupils were specu-

lated on.

Findings

Analysis of cloze passages for diagnosis of pupil weaknesses. It was generally felt that the method was fairly simple and straightforward. However, a more thorough picture could be obtained if a series of cloze passages are used instead of only one or two examples.

Weaknesses of pupils. It was found that pupils were generally weak in vocabulary rather than grammar. In fact, the passages that tested grammar were well done. Although tense and grammar errors were found, these were not as prominent as those in vocabulary. The analysis showed that most of the pupils did have a fairly reasonable amount of grammar expectancy skills. Mistakes in





The Diagnosis

vocabulary included idiomatic expressions (e.g. shaping up) and collocation of words (e.g. consultation with). The difficulties faced by pupils seemed to centre around the following areas: unfamiliar vocabulary (e.g. eerie gurglings), unfamiliar registers or very formal styles and multiple embedding of concepts in complex sentences.

Implications

The analyses showed that valuable information could be obtained to help identify pupils' weaknesses. Teachers are encouraged to use a battery of cloze passages for the diagnosis of their pupils' English language problems. They could do this either collectively as a class or individually for those pupils who have problems with English language.

The results showed that our pupils need more exposure to a wider vocabulary and a greater range of written styles. One solution could be to expand on these areas through comprehension exercises, the reading programme and the choice of books for the pupils. Schemes of work focused round themes could be used. Identification of vocabulary around these would be of great assistance to teachers. Sentence combining exercises in class could also be used to give pupils more exposure to more complex structures. As most of our pupils do not use English informally outside school, they are not very fluent in the

language. Collocation of words and idiomatic expressions taught in class are not reinforced through regular use. Therefore our pupils need to use English language more so that they could be more active users of English language. Every opportunity should be given to them to use English language both during lessons and outside the classrooms. An enriched English language environment in the school will greatly enhance the pupils acquisition of greater proficiency in English language skills.

Conclusion

Though not a very sophisticated instrument, the analysis of the cloze pas-

sage is a good start for teachers who want to gain further insight into their pupils' weaknesses. They could use the analysis/diagnosis to confirm perceptions obtained through informal observations of their pupils and the written assignments completed by them.

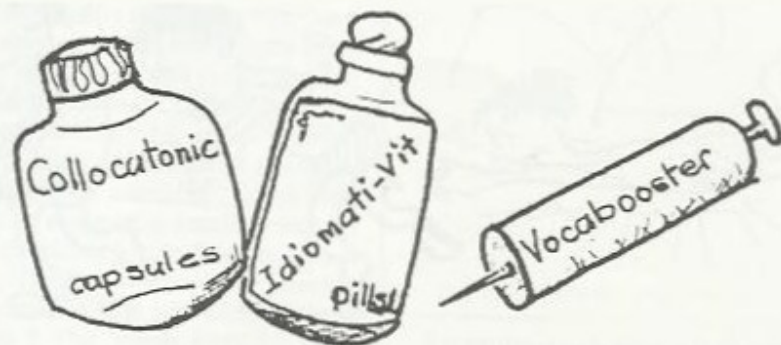
Acknowledgement:

I would like to thank the English language teachers of Yuhua Secondary School for their assistance in the recording and computation of the scores and their interest and desire to learn new strategies.

References

1. Hinofotis, F. B. (1980) "Cloze as an Alternative Method of ESL Placement and Proficiency Testing" in Oller, J. W. & Perkins, K (eds) *Research Language Testing*, Newbury House Publishers Inc. USA
2. Read, J (ed) (1980) *Directions in Language Testing* Singapore University Press, Singapore

Lau Kum Leng is Vice Principal of Yuhua Secondary School, Singapore.



The Remedy

Current trends in mathematics learning: problem solving

Adapting Approaches and Materials to Enhance Success in Learning

In *Agenda for Action: Recommendations for School Mathematics of the 1980s*, the National Council of Teachers of Mathematics gave strong impetus to improve problem solving instruction by stating that problem solving must be the focus of school mathematics in the 1980s, and that "the definition and language of problem solving in mathematics should be developed and expanded to include a broad range of strategies."

The revised mathematics syllabus for the New Education System (Singapore Ministry of Education, 1990) states that "the *primary aim* of the mathematics curriculum is to enable pupils to develop their ability in mathematical *problem solving* ... The conceptualization of the revised curriculum is based on a problem solving framework."

The growing interest and concern about problem solving amplifies the significance of such an approach in mathematics teaching and learning.

What is problem solving?

Polya, the renowned mathematician, states that "To have a problem means to search consciously for some action appropriate to attain some clearly conceived but not immediately attainable aim. To solve a problem means to find such an action." A problem exists when one is confronted with the perplexing difficulty of not knowing immediately how to proceed.

Know-how in mathematics is the ability to solve problems - not merely

routine ones but those requiring some degree of independence, judgement and creativity.

Heuristics

I believe that to teach problem solving successfully, we must teach strategies. "The teaching actions selected for problem solving must be consistent with one's view of how problem solving is learned" (Bourne, Ekstrand and Dominowski, 1971). The teaching actions which are adopted can be based on an information-processing point of view. Using this approach, the problem solver

Know-how in mathematics is the ability to solve problems - not merely routine ones, but those requiring some degree of independence, judgement and creativity.

selects from a variety of different problem solving strategies. The primary goal of the teaching actions is to develop the ability to search among and evaluate alternatives when solving mathematical problems.

Concomitant to this goal is the need to make pupils aware of strategies that are useful in solving mathematical problems and to develop their abilities to utilize these strategies.

Pupils can be encouraged to apply the following features of the *Guess and Check* strategy: make an "educated" guess at the solutions, check the guess against the conditions of the problems and use the information obtained to make a better guess. A quotation from George Polya goes, "Certainly, let us learn proving, but also let us learn guessing."

The *use of tables or lists* facilitates the systematic organization of information and thoughts. Models, like drawings, serve as aids to intuition or to organizing the information for problem understanding. This could further suggest another strategy which can then be applied to solve the problem.

Elimination which involves the selection of clues and the use of reasoning as a strategy for problem solving can also be introduced.

The following techniques can further help pupils to simply problems:

- reword the problem using a familiar context or simpler numbers to help discover the most effective operation;

- divide the problem into distinct sub-problems which can be solved separately or in sequence, adopting Rene Descartes' "Divide each problem that you examine into as many parts as you can and as you need to solve them more easily"; and
- begin with a simpler case of the problem and work through successive cases until a general method is found.

Affective considerations to problem solving involve the desire for solution, the confidence that the obstacles can be overcome, and the belief that their problem solving skills are adequate. It is thus imperative that there be a deliberate gradual development of teaching-learning complexities.

Adapting Problem Solving Materials

In our local context, most of the textbooks and supplementary books contain materials that strongly emphasize an algorithmic approach to the learning of mathematics, and as such they cannot be adequately used to implement fully a problem solving approach.

The following sets of non-routine, problem-solving questions were materials gleaned from a variety of sources and modified accordingly, to cater to the needs and interests of the students in Henderson Secondary School in the *Learning of PATTERNS*.

Set 1: "What Comes Next?" introduces pupils to the concept of pictorial sequences which involved a specific pattern.

Set 2: "Fun with Paper" and "Desk Arrangement" consolidates the learning of the topic with the use of a table as an organizer.

Set 3: "Route Challenge*" and "Route Challenge**" extends the learning of PATTERNS in problem solving.

Set 1: What Comes Next?

Hello! Welcome to the world of beautiful PATTERNS...

Look at the different diagrams in Fig 1. Can you see a pattern for each?

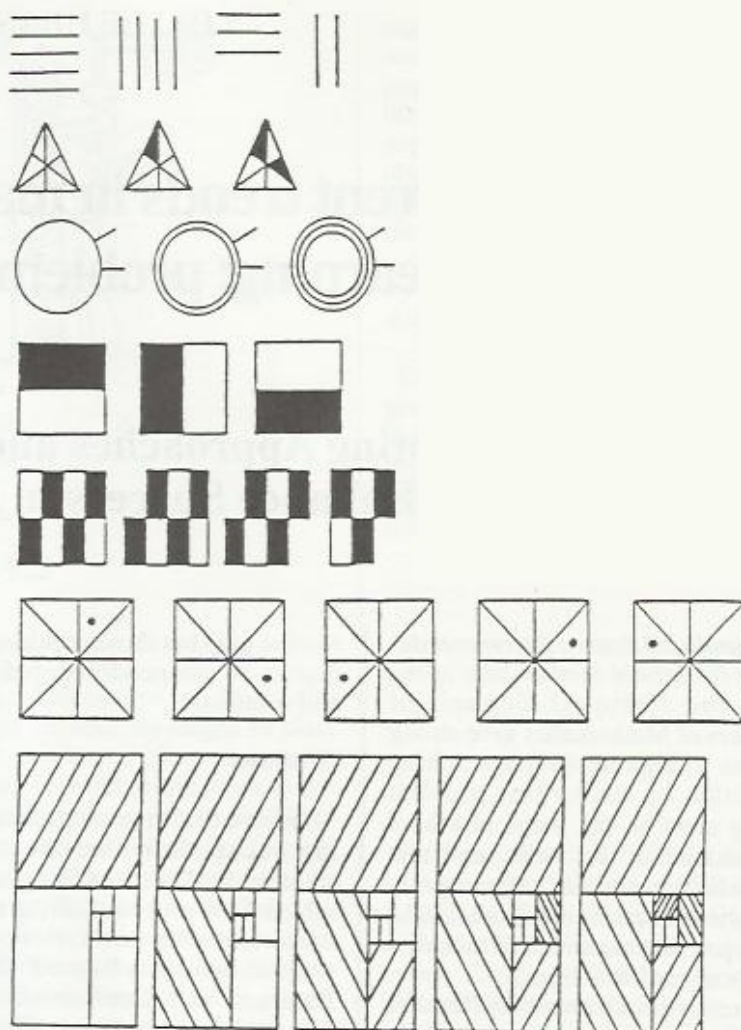


Fig. 1 What comes next?

Think about it and add in the next one for each of the patterns.

Set 2 Question 1: Fun With Paper

You are given a large sheet of paper. Tear it in half. Place the 2 pieces of paper one on top of the other and tear them in half again. This gives 4 pieces of paper. Place them on top of one another, and tear them in half again. How many pieces are there?

Have fun ... continue tearing, counting, recording and thinking.

After 10 such tears, how many pieces of paper do you have?

After n such tears, how many pieces of paper are there?

Set 2 Question 2: Desk Arrangement

You have been selected as the group leader of the Henderson Secondary One Students Council Committee. You have arranged for a meeting in-

volving representatives from every secondary 1 class in the school hall this coming Saturday. There are a total of 6 secondary one classes in the school. Each class has 2 representatives.

In accordance with tradition, the class representatives would be seated at a series of class desks, placed end to end so as to form one table.

What is the minimum number of desks required to seat all the secondary one representatives, given that one side of a desk only be occupied by one representative?

How many desks are required for seating n representatives?

Set 3 Question 1: Route Challenge*

Henda and Sonia are very good friends. They are both working on a joint mathematics project for the "1991 Henderson Mathematics and Science Exhibition." It was agreed that

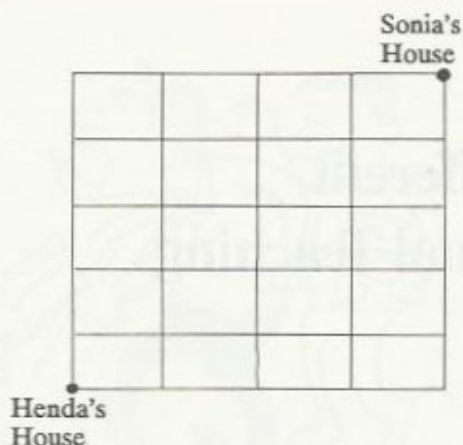


Fig 2

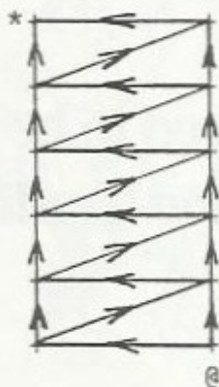


Fig 3

Henda would go to Sonia's house to work on the project.

Fig 2 figure shows where Henda and Sonia live in the neighbourhood. Henda is adventurous and likes to explore. She is determined that on her way to Sonia's house, she would try a different route each time. She also decides to travel only north and east.

How many different routes can Henda take to get to Sonia's house?

Set 3 Question 2: Route Challenge**

Now, let's try another interesting problem. Take a look at the Fig 3. If you are allowed only to move along the directions as indicated by the arrows, how many different routes are there from point @ to *?

In presenting the materials, there was the conscious choice of words like "Henda" (set 3), and "Sonia" (set 3), "Henderson Secondary One Students Council committee" (set 2), "1991 Henderson Mathematics and Science Exhibition" (set 3) to enable the students to identify with the material. There was also a deliberate effort in greater usage of "personal words" (Flesch 1986) to motivate pupils.

Furthermore, the sequence was carefully considered to enhance the possibility of success. The first set of problems was thus relatively simple.

I also find it effective to use the following strategies:

- discuss methods which did and did not lead to a correct solution;
- relate the problem to previous problems;

- discuss special features of the problem; and
- after the completion of each set, elicit from pupils a summary of the key aspects to reinforce their learning.

"Looking back" in problem solving is "...an integral and essential component that offers unlimited opportunities ..." (Taback 1988).

Conclusion

I believe in stimulating our pupils to become active learners and the teaching of problem solving strategies will enable them to become actively involved in their learning.

Problem solving permits pupils to learn and to practise heuristic thinking. Considering the transfer of learning that takes place, the teaching of problem solving skills and strategies is necessary in real life.

The approach also provides an alternative to the usual textbook teaching process. Problem solving is a catalyst for the kind of learning whereby we can train the pupils to learn and think by themselves. Besides getting valuable experiences in problem solving, the wonder and beauty of mathematics would also be conveyed in the process.

"The mathematician's pattern, like the painter's or the poet's, must be beautiful; the ideas, like the colour or the words, must fit together in a harmonious way. Beauty is the first test:

there is no permanent place in the world for ugly mathematics."

G H Hardy

Acknowledgements:

I wish to thank Mr John Cheung and Dr Wong Khoon Yoong for widening my perspective in this area.

References

Bourne, Ekstrand, and Dominowski (1971) in Rachkin, S., & J. McDonald (1982) *MATH Monograph No. 7: Problem Solving in the Classroom*. University of Calgary, Alberta: The Alberta Teachers' Association for the Mathematics Council.

Flesch, R. In *Fractions & Decimals* (1986). Malaysia: SEAMEO-REC-SAM Course 6631 Publication.

Hardy, G.H. In Dolan, D.T. and J. Williamson (1983) *Teaching Problem Solving Strategies*. Menlo Park, California: Addison-Wesley.

Polya, G. (1945) In *FPDE Programme CCI Course Material Handouts*. Singapore: Institute of Education.

Ranucci, E.R. (1988) *Imaginative Ideas for the Teacher of Mathematics, Grades K-12: Ranucci's Reservoir*. Reston, Virginia: The National Council of Teachers of Mathematics, Inc.

Singapore Ministry of Education (1990) *Revised Mathematics Syllabus*. Singapore: Ministry of Education

Taback, S.T. (1988) "The Wonder and Creativity in 'Looking Back' at Problem Solutions." In *Mathematics Teacher*: September 1988.

Lim Lee Hean is a Head of Department at Henderson Secondary School, Singapore.

They Dared to be Different in a Week of Non-Traditional Teaching

Alternative methods can motivate students to achieve higher learning outcomes

The idea of introducing a "Non-Traditional Teaching Week" at Ngee Ann Polytechnic was obtained from an article which appeared in the journal of the Association for Educational and Training Technology. Both Oxford Polytechnic and Bristol Polytechnic in Britain had organised successful Teaching Innovation Weeks in 1987 and 1988. The Polytechnic of Central London also organised a successful Teaching Innovation Week in 1988.

The first Non-Traditional Teaching Week was held from November 27 to December 2 1989 and the second was held from 5 - 10 November 1990. Prior to both weeks, a notice was prepared

and distributed to all members of the academic staff at the Polytechnic. The notice outlined the purpose and advantages of the exercise and provided examples of innovative teaching methods. Staff members were requested to use at least one novel teaching method during the week and to submit a brief description of their innovation to the Educational Development Centre. The write-up was to include any peer or student evaluation of the innovation.

The main purpose of the exercise was to help stimulate lecturers to look at their teaching methods and to try out some innovations. The experiment was valuable for the following reasons:

1. Lecturers tend to get set in their ways and, in the course of a programme of teaching, sometimes do not stop to think of alternatives to well-used methods.

2. Many of the traditional methods do not promote the sort of qualities that industry and commerce require of graduates; the lecture in particular encourages passivity that is inimical to active and enterprising minds.

3. The whole exercise was enriching and enjoyable for all concerned.

During the week many lecturers exposed their students to novel approaches. For example, in Business Law, a panel of students prepared and conducted the tutorial. In a class on the Principles and Practice of Life Insurance a debate was held on a topic related to the syllabus. This was followed by a talk by a visiting expert on the topic. A simulation exercise where students as managers in a production committee had to develop a promotion plan to market their product was conducted by a lecturer teaching Sales and Promotion. Lecturers teaching engineering subjects like factory automation, engineering drawing, electronics and process instrumentation used small group activity, problem solving activities and student presentations.

After the first week, twenty-one submissions were received from the



They dared to be different



Better staff-student relationship

academic staff and they were compiled into a handbook, the first collection in a planned series of handbooks on non-traditional (or, alternative) teaching methods. A second handbook based on the innovative methods adopted by the staff during the 1990 non-traditional teaching week is currently being compiled. The submissions revealed a higher level of interest, commitment and learning from the students.

The learning that took place was more fun and the students seemed to enjoy themselves. They were also more attentive. There was greater stu-

Lecturers tend to get set in their ways and ... sometimes do not think of alternatives to well-used methods

dent participation and the learning was student-centred. Attention was focussed on the students and less on the lecturer. Many of the methods provided the lecturers with a better assessment of the understanding and comprehension that their students had of the topics.

There was opportunity to apply information in different situations and to acquire skills in information gathering. The students had to select, edit and organise the information, all useful skills for their future employment in industry and commerce. Many of the methods used enabled the students to develop their communication skills, in particular, to make good and effective presentations. Students were also able to develop the technique of asking questions and to improve their skills at discussions. In doing all these, their self-confidence was further developed. The methods also encouraged the development of teamwork and cooperation, problem-solving skills, leadership skills and creativity.

The students interacted in more varied and informal ways with the lecturer and this, in turn, contributed to better staff-student relationships. Research studies have revealed that students learn better when they have a better relationship with their lecturers.

The "Non-Traditional Teaching Week" offered the opportunity for staff to demonstrate the use of effective and innovative instructional practices: teaching approaches that actual-

Non-traditional teaching methods enable students to interact in more varied and informal ways with the lecturer and this contribute to better staff-student relationships.

ly work; that do not necessarily require a dramatic revision of a lecturer's teaching repertoire; that do not necessarily demand additional or unique supporting resources to sustain their operation; and, most importantly, that are capable of motivating students in ways that cause them to achieve higher learning outcomes.

Zaibun Siraj is Head, Educational Development Centre, Ngee Ann Polytechnic, Singapore

WILLIAM M. GRIFFIN

Read Aloud Week at Collicot School

Community leaders in Milton, Massachusetts, donated more than 50 hours of excitement and enthusiasm when they read aloud to students at Collicot School

In one of the largest back-to-school partnership efforts ever in our town, 100 community leaders visited Collicot School, Milton, Massachusetts, to read aloud to our students. During Read Aloud Week, these volunteers gave more than 50 enthusiastic hours so that each classroom would have at least one visiting reader every day.

Most of us in elementary education have long believed that reading aloud to our students is worthwhile, if for no other reason than that they enjoy it. But when Jim Trelease, author of the *Read Aloud Handbook*, spoke to our Parent-Teacher Organization, he emphasized the value of reading aloud to young children to strengthen their language development, the growth of their imaginations, and their love for literature. He also explained the long-term academic payoff for students who had been read to as youngsters. In

short, he provided the authoritative evidence for what we had sensed.

Following that PTO presentation, teachers began including read-aloud time in their lesson plans; but we all felt the need to do more, to somehow involve the community and the parents. We began with the idea of contacting people our students would not usually think of as "readers". By bringing in dentists and priests and politicians, we hoped to show our students that reading is important to adults other than their parents and teachers.

We drew up a list of people to invite, a wish list that included the Vice-President of the United States. While waiting for responses to our invitation, we collected books from our school library, from the public library, and from our homes. The Student Council donated \$50.00 from their school store

profits to purchase additional books for the week.

We followed up our RSVP deadline with phone calls (the Vice-President was busy), then invited more readers. We publicized our plans in the local newspaper and appealed for more volunteers. We filled all but two of the 106 time slots, in many cases matching volunteers with favorite books they specifically requested.

The enthusiasm and ingenuity of our visiting readers surprised both faculty and students. One volunteer wrote an original story with a horse for the main character; on the day of the reading a companion brought a horse to school, complete with glasses and a school bag on his back. A local police officer read to the 2nd grade from the back of his police wagon, a parish priest conducted singing as a pre-reading activity, and a pediatrician read the poetry of Shel Silverstein.

The spirit of Read Aloud Week has lingered with us. Teachers began using their planning periods to read aloud to each other's classes. The local cable TV company taped readers each day and showed an hour's worth of tape each night. Collicot School's first Read Aloud Week was such a success that we are planning to make it an annual event.

William M. Griffin is Principal, Collicot School, Edge Hill Road, Milton, MA 02186.

Reprinted with permission from Educational Leadership (May 88)



