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ABSTRACT

Higher order thinking can be defined as interpreting, analyzing, and manipulating information to solve a challenging problem. This definition does not restrict higher order thinking to any level of cognitive ability or any class of people; it includes thinking involving both nonacademic and academic topics; and it is not limited to any particular pedagogical method or theory of cognitive processing. Teaching higher order thinking involves teaching the information to be thought about, the skills with which to do the thinking, and the attitudes that predispose the individual to think. Teaching higher order thinking in schools is hampered by the typical curriculum's demand for broad but superficial subject coverage, by pedagogical methods that encourage student passivity, by the need to work with students as groups rather than individually, and by cultural biases against independent thinking. To support the teaching of higher order thinking, principals must first obtain the commitment of the faculty. Such a commitment can be enhanced if the principal places a priority on depth rather than breadth in the curriculum, encourages more active pedagogy, works to reorganize the school to improve the conditions for learning higher order thinking, and promotes a schoolwide culture of thoughtfulness. (PGD)

Higher Order Thinking in the High School Curriculum

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Recent discussion of educational reform includes a variety of proposals for greater emphasis on the teaching of thinking. School districts and professional organizations have sponsored a number of programs, and scholarly literature on the topic in psychology, philosophy, and cognitive science has blossomed. The proposals, programs, and research, include diverse, even contradictory, perspectives. There have been many proposals, but little research on their effects, and virtually no research on the question of why it is apparently so difficult to promote thinking in high school classrooms. In this review, I address three questions: What is higher order thinking? Why is it so difficult to promote in high schools? What can principals do to help?

I What is Higher Order Thinking?

Many terms have been used to define higher order thinking: critical thinking; abstract, deductive and inductive reasoning; formal and informal reasoning; Piaget's formal operational thought; Kohlberg's post-conventional moral states; metacognition; Bloom's categories of analysis, synthesis and evaluation; divergent and creative thinking; the solving of ill-structured problems; the construction of meaning. In spite of these separate positions, I think it is possible to formulate a general conception, consistent with technical literature, which also can guide practice.

Any human whose mind receives stimuli from the environment engages in thought - in the sense that the brain functions to code, to store and to process information. Further, almost all cognitive processes, from watching TV commercials to reading road signs, are certainly complex in a neurological sense. What, then, distinguishes higher order thinking from other forms of thought?

A. A Definition

There is a common sense difference between higher order and lower order thinking. It is suggested in the contrast between ideals for schools and the reality reported in numerous observations of thinking in classrooms. The consistent observation is that most students are rarely challenged to use their minds. This concern suggests a simple definition: higher order thinking signifies challenge and expanded use of the mind; lower order thinking signifies routine, mechanistic application, and constraints on the mind.

Challenge or the opportunity to expand the use of mind occurs when a person must interpret, analyze, or manipulate information, because a question to be answered or a problem to be solved cannot be resolved through the routine application of previously learned knowledge. The explorer trying to travel successfully over unknown terrain illustrates

the idea that previously acquired knowledge and skills (map and compass use, knowledge of weather, survival techniques, etc.) must be applied in a new situation to reach the destination. Success requires considerable knowledge, but, because of the novelty of the task, how to apply the knowledge poses a significant challenge.

In contrast, "lower order" thinking generally involves repetitive routines such as listing information previously memorized, inserting numbers into previously learned formulae, or applying the rules for footnote format in a research paper.

The critical part of this definition is using, or going beyond the information that one has previously acquired in order to solve a problem. Challenging problems can appear in many forms, in all curriculum subjects. They may lead to single, correct, and well-defined answers or to multiple, ambiguous, conflicting solutions. The challenges may involve different kinds of inquiry (logical, empirical, aesthetic, ethical), different forms of expression (oral, written, non-verbal), different types of intelligence (verbal, mathematical, kinesthetic, interpersonal).

This conception stipulates what an individual should do with information (interpret, analyze, manipulate), and the occasion necessary to provoke such use (a challenging problem). Individuals will differ, of course, in the kinds of problems they find challenging. For one person, trying to understand how to read and follow a bus schedule may require higher order thought, but for another, the same task will be routine. In this sense, higher order thinking is relative: to determine the extent to which an individual is involved in higher order thinking, one would presumably need to know much about the person's history. Furthermore, to assess the extent to which a person participates in the analysis, interpretation and manipulation of information, one would want to "get inside" the person's head or experience his/her subjective state of thought. This, of course, poses an operational problem. It is difficult to determine reliably the extent to which a person is involved in higher order thinking.

Teachers who interact with several students at once have little opportunity to gain knowledge about students' individual mental states. Instead, they must make assumptions about the prior knowledge of groups of students, and assumptions about the kinds of mental work that particular tasks are likely to stimulate. The teaching of thinking, therefore, is a rather crude enterprise. To the extent that our assumptions about students' prior experience are correct, we can pose appropriately challenging problems. Our assumptions may be wrong, but

the best we can do is to engage students in what we predict will be challenging problems, to guide their manipulation of information to solve them, and to support their efforts.

In spite of the practical difficulty just mentioned, this conception of higher order thinking has several positive features.

(1) It assumes that any person, young or old, regardless of experience, can participate in higher order thought. Of course, people will differ in the kinds of challenges they are able to master, but all students are capable of confronting a challenge in the interpretation, analysis and manipulation of their knowledge.

(2) It encompasses problem-solving in a wide range of school subjects as well as in non-academic areas.

(3) It does not require acceptance of any particular theory of cognitive processing or a particular pedagogy. This is an advantage, because solid knowledge on the best techniques for the promotion of thinking does not exist. It is likely that the effectiveness of techniques will depend largely on the nature of the mental challenges presented and the kinds of students exposed to them. Furthermore, this conception is hospitable to three perspectives on thinking that otherwise may seem at odds with one another; namely, the content, the skills, and the dispositions perspective.

B. The Place of Content, Skills, and Dispositions

Research on higher order thinking and on how to teach it reflects three distinct points of emphasis. According to the content perspective, complex thought is largely a function of what a person knows. One cannot think about nothing. Sophisticated understanding or the mastery of complex challenges occurs only through the use of knowledge in a subject, whether it be consumer decision-making or interpretation of poetry. Of course, subjects can be taught in ways that fail to promote thinking, but thinking cannot be taught apart from knowledge of subjects. Some would argue that the proper teaching of a subject is equivalent to promoting higher order thinking, because it should demand that students interpret, analyze and manipulate knowledge to face new challenges within the subject.

According to the skills perspective, thinking can be defined in terms that may transcend specific subject matter, and to teach thinking, we must teach skills, not just content. A good thinker, for example, can identify a problem, state alternative solutions, offer evidence, judge logical consistency, detect bias, and find new sources of information. Because such skills seem to assist problem solving in a number of

subjects, they are called general thinking skills. A strong case is also made for the significance of "domain-specific" skills, such as solving quadratic equations in mathematics, use of laboratory equipment in science, or jurisprudential reasoning in social studies. In short, the skills perspective argues that content alone is insufficient, that students must be taught specific techniques for interpreting, analyzing and manipulating content.

The dispositions perspective contends that higher order thinking requires something even more fundamental than the mastery of knowledge or skills, that is, an underlying disposition of thoughtfulness. Thoughtfulness consists of several traits: a general desire that claims be supported by reasons (and that the reasons themselves should be scrutinized); a tendency to be reflective - to take time to think problems through for oneself, rather than acting impulsively or accepting automatically the views of others; a curiosity to explore new questions and the flexibility to entertain alternative and original solutions to problems. The disposition thus involves attitudes, personality or character traits, and broad world views about the nature of knowledge. Thoughtfulness is seen as a necessary, though not sufficient condition, for higher order thinking. Content and skills will be important for the mastery of particular challenges, but without a disposition of thoughtfulness, content and skills can be taught and applied mechanistically and foolishly.

Each perspective speaks to important dimensions of higher order thinking, and each reflects the traditional goals of schools - to teach subjects, skills, and attitudes. Principals as instructional leaders, therefore, must find ways to help teachers address each perspective explicitly, so that none is neglected, and so that all are marshaled toward the goal of helping students not simply to acquire information, but to interpret, analyze and manipulate information to solve challenging problems.

II Why is Higher Order Thinking So Hard to Promote?

Almost everyone agrees that we should teach kids to think, but national studies of high school classrooms indicate that, except for the highest track classes, cognitive work remains at low levels: students are asked to acquire information, but not asked to use it in challenging ways. At the Center, we are trying to learn why students, teachers, even parents, may resist the promotion of thinking in the schools. The barriers we find seem rooted in four main sources: curriculum, pedagogy, school organization, and culture.

A. Curriculum - superficial coverage.

The more one knows about a topic, the greater the likelihood of higher order thinking, because increased knowledge brings more possibilities for interpretation, analysis and manipulation of that information. High schools teach an abundance of knowledge, but, because it is organized around broad surveys of many topics, it is usually too fragmented and too diffuse to be useful. Most textbooks contain dozens of chapters that span such a range of knowledge that only superficial coverage can be given to any topic. Testing programs require students to show knowledge of selected fragments of knowledge from the entire span, rather than how they think about problems in depth. Teachers express frustration that they are continually behind in covering the material. To cover it all, most of the teaching time is spent dispensing the knowledge. There is little time to reflect carefully upon it, to help students to interpret, analyze and manipulate the knowledge they may have acquired.

B. Pedagogy - student passivity.

The dominant form of classroom discourse is the teacher talking to students who listen or who complete routine exercises designed to help them acquire information. Higher order thinking requires that students be active in the use of information. This calls for individual quiet study, to be sure, but it also requires students to express themselves, orally and in writing, and to physically manipulate information and artifacts. While most of us affirm that students can learn only if they work at it, the pedagogy we use provides little opportunity in the classroom for students to do productive work with the knowledge they study. The pedagogy stems largely from the curriculum orientation to cover or to dispense knowledge, rather than to work with it. It is also due, in part, to the way students are grouped and scheduled for instruction; that is, the way high schools are organized.

C. Organization - mass processing.

If students are to learn to interpret, analyze and manipulate information successfully, they will need constructive and reasonably detailed feedback on their approaches to problem-solving, both as they proceed and after they have developed solutions. If teachers must respond to 25 students at once in a class period, and if they are responsible for teaching 130 students per day, it is hard to imagine how meaningful individual feedback can be offered. If problem-solving must be confined to a fifty-minute period on five different days each week, this limits the kinds of problems that can be studied and the process of inquiry available to solve them. Youth and adults engaged

in complex problem-solving beyond school, on the job or in leisure time, may have deadlines and time constraints, but usually none so rigid as the scheduling of thinking in school. Furthermore, some problems require sources beyond the classroom to which the student needs access (computers, libraries, experts in the community). To the extent that the school confines students to classrooms, they also limit the potential for higher order thinking. In each of these ways (class size, teacher load, time schedule, classroom confinement), the organization of learning in high schools can pose important barriers.

D. Culture - mental leisure.

Having described roadblocks in curriculum, pedagogy and school organization, we must now ask, "Why don't we, the educators, parents and students, replace the roadblocks with more support for higher order thinking?" Various reasons can be offered, but most can be reduced to observation that as a whole, in comparison to other objectives for schooling, people don't want the schools to promote thoughtfulness. Higher order thinking requires special mental effort: the resolution of conflicting views, tolerance for uncertainty and ambiguity, self-criticism, independence of judgment (rather than dependence on authorities), serious consideration of ideas that may challenge conventional wisdom or doctrine. In short, it involves hard mental work, and because it may also occasionally threaten existing personal or group interests, the results of this kind of work may not always be rewarding for the student. For many, it is more satisfying simply to take in the information dispensed and to reproduce it as called for by teachers, employers, test-makers, and others. Some students may work very hard to master the information dispensed, in order to "succeed in life," but even for these students, the goal is usually to gain success with minimal mental effort. The cultural preference for mental leisure can be summarized by the question, "Why think if you don't have to?"

III What Can Principals Do to Help?

If curriculum, pedagogy, school organization and culture all militate against higher order thinking in the high school, what can the principal do? There are no easy answers, and significant progress will require long-term effort. If I wanted to work on the problem, as a principal I would try to attack concerns in each of the four categories. I would try especially hard, however, to ground the entire effort in a program that helps the staff to develop its own commitment to the goal of promoting higher order thinking. Depending upon the school, there may be pockets of faculty support, confusion, apathy or vigorous opposition to the goal. Faculty will need time to study and to consider carefully the types of higher order thinking to promote.

How to develop a cohesive, examined sense of faculty ownership on this matter is beyond the scope of this presentation, but here are some ways in which the principal can support it.

A. Support "depth" in the curriculum. Higher order thinking is more likely if students learn more about a smaller number of topics or subjects. If teachers are to move in this direction, they will need assurances that (1) tests requiring broad, survey knowledge will occupy relatively low priority in school testing; (2) new instructional materials will become available (either through purchase or local development) to replace traditional survey-type texts and tests; (3) students' programs of study will concentrate on fewer courses, and the connections between courses will be stronger (taking a host of unrelated courses only accentuates the tendency toward superficial coverage.)

B. Assist staff to develop more active pedagogy. Time should be provided for staff to experiment with teaching techniques that help students to work with the information they learn. Teachers need time to observe one another's teaching, to consult with one another, and to examine higher order thinking pedagogy in other schools and projects. The promotion of higher order thinking through a pedagogy that helps students to become more active should become a criterion for formal teacher evaluation.

C. Work toward changes in teacher load, scheduling, and the location of learning. Ideally, the high school would be designed to conform to the needs of appropriate curriculum and pedagogy. As indicate above, however, organizational constraints tend to determine what seems possible for curriculum and pedagogy. To expand teachers' visions about what is possible, the staff needs assurance that the administration is willing to modify some of the organizational constraints. How to address the issues of teacher load, class size, scheduling, or the location of learning must be determined within the local school. The critical need is for administrative willingness to modify some of these patterns to meet a new instructional emphasis.

D. Promote a school-wide culture of thoughtfulness. Schools have a special role to play in offering youth a sanctuary from some of the less desireable forces in the world at large, especially mindlessness. Thinking may be difficult, and at times painful, but it can also be joyful, exciting, rewarding - depending upon how it is supported and received by others. Classrooms are the most critical places for the development of a culture of thoughtfulness, but teachers can't do it alone. If it happens only in class, it becomes less authentic, confined to these even more isolated sanctuaries. A school-wide climate of thoughtfulness is needed. Principals can help to reinforce this by promoting thorough examination of school issues by faculty and

students, by reinforcing the value of independent thought in the various parts of the school: disciplinary procedure, guidance, athletics and extra curricular activities. In short, principals must find ways to reward students and staff not simply for attending, staying out of trouble, meeting their official responsibilities, attaining high grades and scores, but for showing that they have used their minds well in both official and unofficial tasks.

Based on our review of literature, our observations of classes and interviews with teachers and students, I've offered a conception of higher order thinking, some explanations of why it is so hard to promote in high schools, and suggestions for how principals might help. What do you think?