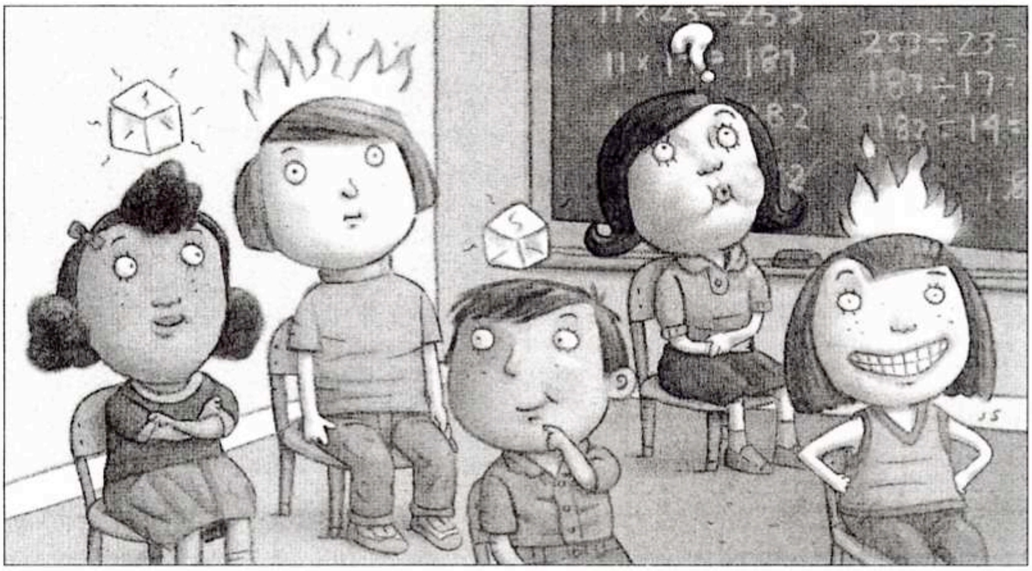
What Is Fifth Grade?

After playing a game of inference with three groups of children in the fifth grade or higher and getting fundamentally different results, Mr. O'Brien and Ms. Wallach question our understanding of "grade level."



BY THOMAS C. O'BRIEN AND CHRISTINE WALLACH

IN HIS classic book *The Culture of the School and the Problem of Change*, Seymour Sarason asks readers to imagine that they are space aliens looking into the buildings called schools. "What is it that happens with regularity?" he asks, "and why do these things happen?"[1]

One of the most consistent regularities observers would see in schools is the grouping of children by grade. And our work with schoolchildren causes us to ask, What is a grade beyond a group of children at a particular age?

Let us share a glimpse of an activity involving inference and logical necessity that we (Tom and Chris) conducted with three groups of schoolchildren. By "inference" we mean deriving new information from old information. We invite you to conduct the activity with children in various grades and learn about the status and development of some essential logical abilities.

The activity calls for at least four children to sit in a circle in front of a class. The teacher secretly writes down the name of one of these children. This person is called the Mystery Person.

The rules of the game are very simple. The goal is to figure out the identity of the Mystery Person. The members of the class who are outside the circle (or all the chil-

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Illustration by Jem Sullivan

dren, if you like) ask the teacher about children in the circle.

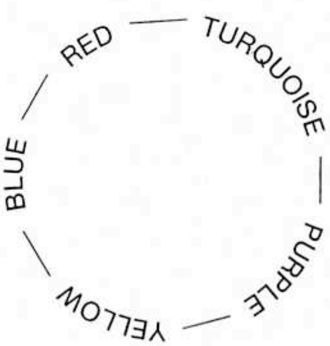
- If the person named is the Mystery Person, the reply is Hot.
- If the person named is seated next to the Mystery Person, the reply is Hot.
- Otherwise, the reply is Cold.

The children ask questions, receive feedback, use the feedback to cancel people in the circle as potential Mystery Persons, and then decide whether further information is needed or whether the Mystery Person can be identified with certainty.

When the children say that they have inferred the identity of the Mystery Person, no further questions and clues are allowed. They tell the teacher the result of their inferential thinking and find out if their deductions are correct.

So that readers have a feeling for how the game is played, here is an example of an actual game involving five children in a circle. Because Tom was a visitor to the class and didn't know children's names, we use shirt colors to identify them: Mr. Yellow, Madam Blue, Madam Red, Mr. Turquoise, and Mr. Purple.

Suppose you were an observer and asked, "Is the Mystery person Mr. Purple?" The reply was "Hot." Then suppose you asked, "Mr. Turquoise?" and the reply was "Cold." Would you have enough information to decide who the Mystery Person was? If not, what question would you ask next?



Now suppose, instead of "Cold," you learned that Mr. Turquoise was "Hot." Would you have enough information to decide who the Mystery Person was? If not, what question would you ask next?

So the game is fairly simple. But as you'll be able to see from our description of our activities with three groups of children, the thinking is not.

GROUP 1

The activity took place with 14 fifth-graders in a middle-class private school in a major city, during two 30-minute periods, two weeks apart. The curriculum of the school involved thinking and problem solving, characterized by the label "teaching for understanding." Textbooks were rarely used. Here is a sample of a game, using the same five colors to identify the children in the circle.

Question 1: "What about Blue?"

Answer: "Blue is Hot."

"That means that Purple and Turquoise are out. They can't be the Mystery Person."

"So that leaves Yellow, Blue, and Red," the children all said. "What shall we try next?"

"Let's try Yellow. If the answer's Cold, Yellow and Blue are canceled as the Mystery Person, and we are left with Red."

"We could also try Red."

"That's the same as trying Yellow. Same sort of thinking."

"But if we try Red or Yellow and get a Hot, we have one more question to ask. The new Hot won't let us cancel anything."

"Right. So let's ask about Purple. If Purple is Hot, we know that the Mystery Person is Yellow. If Purple is Cold . . ."

Another child interrupted, "We would still be left with two possibilities, Blue and Red, and we'd need one more question."

In this way, the children asked and canceled and thought their way forward to the next potential question to test whether the present question was a powerful one.

At the end of the second session, two children wondered aloud how many questions they would need to be sure of finding the Mystery Person if there are five kids in the circle. Three was their hunch, and they set about a series of if/thens to check their hunch. In general, they proceeded confidently and correctly, almost always asking the most powerful question and always finding the Mystery Person.

"What could we do to make the game harder?" Chris asked the children.

"Add more people to the game," replied one child.

Previous experience had convinced Tom that this response was almost universal at this age. He commented, "I think you'll find that it makes the game more cumbersome but not more challenging."

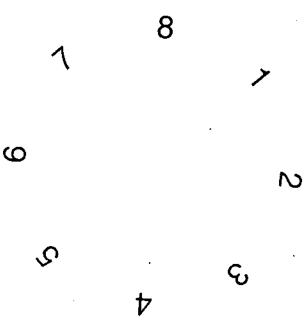
"Try for two or more Mystery People," said another child. With this, one child ran to the chalkboard. "We'd need more than five people," he said. "With five people there might sometimes be no solution. For example, suppose the two Mystery People are not next to one another. You'd have Hots all over the place. And for four people there would *never* be a solution." Thus the second session ended.

GROUP 2

This time, the activity took place with eight fifth-grade children in a private suburban school, again involving two 30-minute periods, two weeks apart. The curriculum was textbook dominated. The results were very different.

This time, all eight children formed the circle, and all took part in the activity. We use numbers to designate individual children.

Suppose that the first question revealed that person 5 was HOT. Children were able to see that 4, 5, and 6 would be potential Mystery Persons and to say that 1-3 and 7-8 could not be Mystery People. But there was some confusion about what happened next. After the next question, 6 was found to be Hot, so the children deduced that 7 became "uncanceled" and was again a possible Mystery Person.



The inconstancy of canceling showed itself in another way. At a certain point we asked all eight children to stand up in a circle. Standing meant that a person was a possible Mystery Person. If a child got canceled as a possible Mystery Person by the evidence, that child had to sit down.

Suppose we learned that Person 2 was Cold. Person 2 sat down — as did 1 and 3. But now suppose it became known that person 4 was Hot. Person 3, once canceled, stood up again.

The rule "If a person is Hot, it is the Mystery Person or it is next to the Mystery Person" was being applied as *absolute* rather than *relative*. Thus the news that 4 was Hot was seen as implying that 3 could be the Mystery Person, prior evidence notwithstanding.

Further, Cold was seen to imply not only that someone was canceled as a possible Mystery Person, along with his or her immediate neighbors, but also as ruling out a Hot among the immediate neighbors.

This is a classic example of what Tom has called "atomism." Atomism is "a view that the world consists of unrelated isolated atoms. For example, when a family drives across Memorial Bridge in St. Louis, a young child may say, 'Look at the Arch!' Seconds later the child may take another look, this time from a different perspective, and say, 'Look! Another Arch!' "[2] And so, in virtually every game, children had floating Mystery People. In short, there was no permanence to the cancellations, and the children's play tended toward chaos.

In general, the children proceeded confidently and correctly, almost always asking the most powerful question and always finding the Mystery Person.

The only game that most of the children were able to solve involved the following data:

Question 1: "What about 8?" "Cold."
Question 2: "4?" "Hot."
Question 3: "3?" "Hot."
Question 4: "5?" "Hot."

Only in this case, where three contiguous children were Hot, was the group able to arrive at a near-unanimous conclusion: the middle child was the Mystery Person.

GROUP 3

The activity took place with three seventh-grade children in an inner-city parochial school, involving one 30-minute period. The children were selected because they were judged to be the ablest in their class. The curriculum of the school was characterized by memorization. At the time of this visit, the pupils were memorizing the bones of the body.

Tom and Gail, another adult, formed the fourth and fifth members of the circle. The players were Al, Bob, Charles, Gail, and Tom.

The rules were explained to the children, and a specific example was given: "Suppose that Bob is the Mystery Person." (Tom points to Bob.) "This means that Bob is Hot, and it also means that Al and Charles are Hot." (Tom points to Bob and to Al and Charles.) "And, since Gail and Tom are not the Mystery Person and are not next to the Mystery Person, they are Cold." (Tom points to Gail and himself.)

What happened in this case was that the children brought their own "evidence" to bear on the problem and did not invoke any of the consequences of the

Hot/Cold information that Tom had given them.

"It's got to be Al because he is next to the teacher (Tom)."

"It is Bob because tomorrow is his birthday."

In all games attempted, the children had no success. They seemed to have no notion of how to obtain information or how to use what they already knew to infer consequences (i.e., canceling group members). And this persisted despite frequent restatements and acting out of what was meant by Hot and Cold. This is an example of what Tom has called "reverse atomism" — the imposition of relationships where they don't exist.[3]

SOME INFERENCES ABOUT FIFTH GRADE

Although the activities were essentially the same in all three groups, the behavior of the children was very different. Their approach ranged from the sort of mastery one might see with mature adults (and a willingness to move on to higher challenges) shown by Group 1, to the atomistic approach employed by Group 2, to the almost complete noncomprehension of Group 3.

And this is not a simple matter of doing better or worse at the same kind of behavior. This was not a situation in which one group memorized the capitals of 45 states, the second 24 states, and the third 15 states. The behavior of these children was *fundamentally* different from one group to another. Nor were the differences the result of material having been "covered" with one group but not another. The task was equally new to all three groups.

Thus we must ask ourselves, What is fifth (or any) grade? Certainly, it is a collection of children of roughly the same age. Is it anything more? These experiences suggest that the meaning of "grade 5" is shaky indeed. Here are some questions and speculations we offer in light of the findings we've presented here.

First, American schoolchildren have traditionally moved through the grades in assembly-line fashion. Worse, now that No Child Left Behind is the law of the land, they must produce scores according to a fixed schedule dreamed up by bureaucrats. If indeed inference and logical thinking are important goals under NCLB, how does the law accommodate the findings we have presented here?

But even if we wish to respond to the findings presented here, what can we do in school to promote logical thinking? We make no claim that the approach to education employed by each school was fundamentally responsible for the differences we observed — although each particular approach is likely to be a contributor. A much more detailed study would be needed to investigate this relationship.

One danger we will face, teachers tell us, is that the issue might get no attention at all. "We deal only with what's on the test," they say. "It may be utterly essential for children's well-being, but if it's not tested it's not important to me." For pupils like those in Groups 2 and 3, it might be wise to pose similar, but simpler, activities so that the children can make sense of the issues and develop inference tactics — among them proper use of data, avoidance of irrelevant information, and systematic canceling. However, given the prominence of test scores these days, it is a rare school that would take time out to back up to try simpler tasks.

We hope that it would be possible for teachers who face such classes as Groups 2 and 3 to try different things to see what works. Looking at our results, a veteran teacher said, "You can't make progress unless you have an opportunity to make small steps. You don't start children off with advanced calculus; you give them ladders to get there."

So what might be responsible for the fundamental differences in reasoning among the groups? Children bring certain things to school — attitudes, interests, networks of ideas, abilities, and so forth. So do teachers. So does the curriculum, in the form of its often untested assumptions about what children bring to school and about ways to cause learning to take place. These days, we seem to be pretending — in the spirit of the "cult of efficiency"[4] — that learning is one-way: it consists solely of the impact of schooling on passive organisms called children and has little to do with what the students, teachers, or curriculum bring to the school.

Finally, the present findings suggest a new arena for the attention of decision makers and researchers: learners' success in tackling new ideas. Rather than limit emphasis (and tests) to the delivery and storage of material — i.e., the acquisition of facts and ideas that have been taught in class — a fruitful arena may be research into the ability of pupils to meet and resolve issues that are new to them.

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1. Seymour B. Sarason, *The Culture of the School and the Problem of Change* (Boston: Allyn and Bacon, 1971), p. 63.
2. See Thomas C. O'Brien, "Why Teach Mathematics?," *Elementary School Journal*, February 1973, pp. 258-68.
3. Ibid.
4. Raymond E. Callahan, *Education and the Cult of Efficiency* (Chicago: University of Chicago Press, 1962).