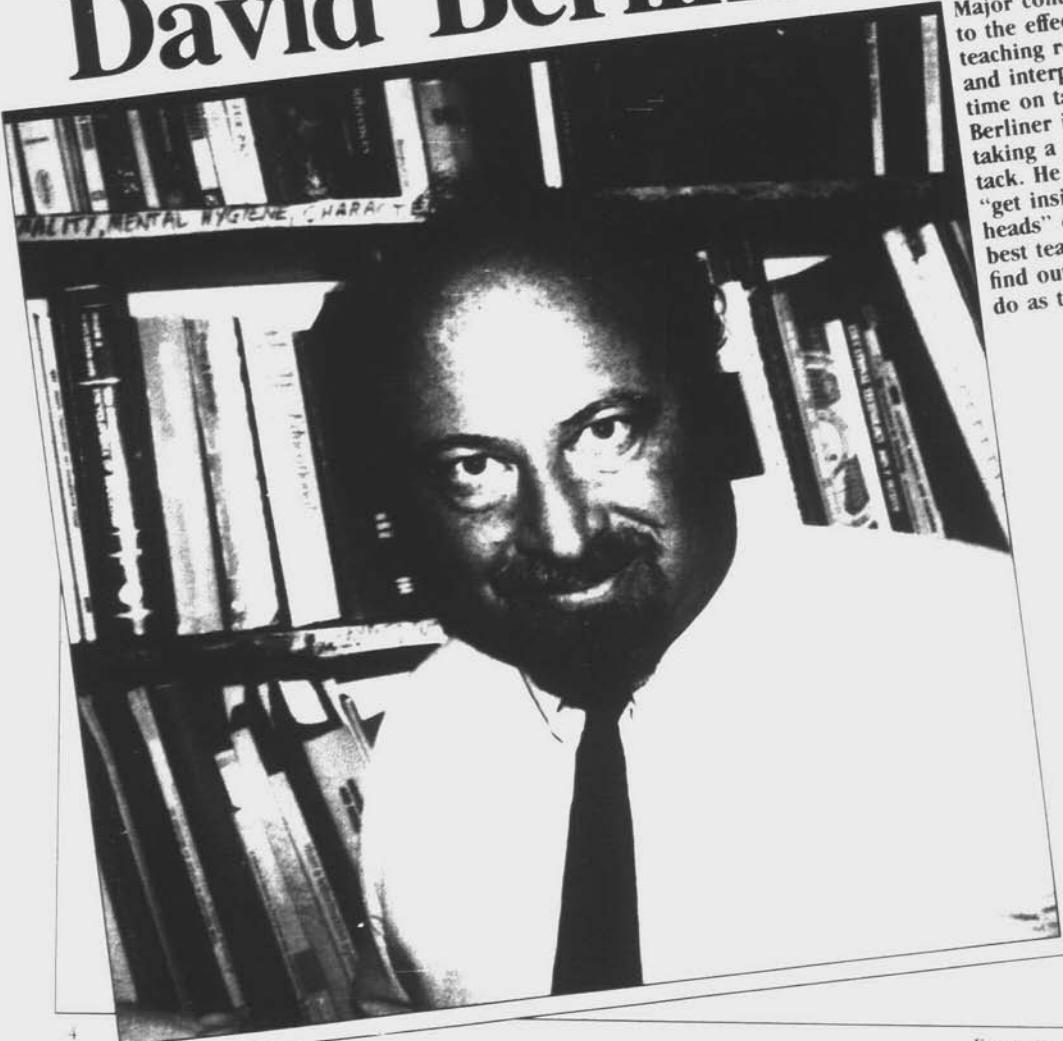


On the Expert Teacher: A Conversation with

David Berliner



Major contributor to the effective teaching research and interpreter of time on task, David Berliner is now taking a different tack. He wants to "get inside the heads" of the very best teachers to find out *why* they do as they do.

Your current research is focused on learning how expert teachers think. Why?

I felt the research on teaching was going in a direction that didn't take seriously a view of the teacher as executive, as high-level decision maker. To do that we had to identify experts: teachers with lots of experience who could articulate the internal workings of their minds. If we could find out how they differed from novices, it might tell us something about training needs.

By novices, do you mean beginners who have some training in education?

Novices have either had student teaching or are in their first year of teaching. They have studied pedagogy, but are new to the field.

In addition, I wanted to know how the thoughts of experts differed from those we call postulants: educated people who lack training in education, but who want to become teachers.

With the shortage of teachers in fields like science and mathematics, there are moves—as in New Jersey—to try to attract such people to enter the teaching order.

Yes, I have a view about that. Nobody expects to walk in off the street, no matter how technically able he or she is to fly a Cessna, and fly a 747. No matter how many medical books he may have read, nobody expects to walk in off the street and do brain surgery. But somehow it's fashionable to think you can walk into a classroom of 32 kids—many of whom aren't sure why they are there—and teach them. That's wrong and insulting to teachers.

How did you go about finding expert teachers?

We began by asking secondary principals to nominate their best math and science teachers. Then we arranged for three independent observers—all of whom were trained teachers and who had talked together about what they thought an expert ought to be like—to observe the teachers on multiple occasions.

So your current work is concerned only with secondary mathematics and science teachers?

Yes, and for that reason we hadn't the luxury of a clear outcome measure as we might have if we had used elementary teachers. At the secondary level you don't have test data, because the standardized tests aren't geared to particular courses, and you can't say as readily what effect a teacher of biology or chemistry has had on students' science knowledge.

You looked into some existing systems for identifying exemplary teachers, didn't you?

Yes, and we found that the procedures used often have little to do with the teachers' expertise as a classroom teacher. Take the Teacher of the Year Program. Now, I've talked with numbers of Teachers of the Year—state and national—and there is no doubt in my mind that they're an exceptional group: smart, nice, and articulate. But whether any of them could be classed as experts, I don't know. They're not selected on that basis.

In one state, a criterion is community activities, including church work. In another state they told us a criterion is "really loving children." Now, these are not bad things—you want community involvement and love of kids—but most of us would hesitate to say those are sufficient conditions for expertise. I'm not sure they're even necessary.

We found that at the state level they often rotate the judges every year so as to have maximum involvement in the process. Now, how would you like to politicize figure skating that way? Or how about having different umpires in baseball every year to spread it around?

At the national level we found that the final interviews are conducted by representatives of *Good Housekeeping*. I have no idea what *Good Housekeeping* magazine knows about teaching.

You mentioned figure skating. There are other models, then?

Absolutely. The model I have become enamored with is cattle judging. There are universities, like Oklahoma

and Texas A & M, that actually recruit judges. They get them out of 4H clubs, for example. They hold judging contests, where these college kids will spend four to five hours a day in judging against established criteria. After the judging they go into the laboratories and slaughter the cattle to find out how close they've come: how much fat on the meat, the bone structure of the cow; they are even trained to judge the beauty of cows. There is a notion of cow beauty that I didn't know existed.

But, of course, judging teaching is different.

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The difference is practice. It takes 15 years to become an Olympic skating judge. Ten years to be a diving judge. We all marvel at the reliability of the judges as we look at the Olympics every four years. That doesn't just happen. Those people have 20 or 30 years under their belts learning to do that—but our state departments of education pick new people every year and give them little or no training. Some states pick parents as judges and provide them with half a day of training. What do parents—just because they're parents—know about judging teaching performance? It's an insult to the profession.

The Kennel Club requires ten years experience in breeding dogs before you can even submit your name to be a judge. In the Kennel Club you have to post your name in the *Gazette* and they present it to all members to see if you have the moral fiber to be a judge. And why not? There's money and prestige involved—just as there is in teaching.

Before you began your investigation you reviewed the research on experts in other fields.

Yes. The modern research starts with republication about 20 years ago of a book about expertise in chess by de Groot. In that original study, which took place before World War II, the researcher found that chess experts had unique characteristics: their memory for chessboards, for example, was enormous. The world-class chess players might actually have stored in their minds 50,000 images of chessboards that they could call upon at any time. As they played the game they were looking for a match between the game they were playing and a model in their heads. The minute they had a match, they knew how to go about trying to win. That's why some could play 18 games simultaneously. Once they discovered which game they were playing, it was relatively easy for them.

And what was this fabulous memory based on? Well, first of all, enormous experience—thousands and thousands of chess games. But it was also based on a language for describing

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chess and on reflection about what the players did. Someone could say, "Remember that Rostropovich game in 1898?" and everybody would remember the game and all the moves, just as when we were kids we might have said, "Remember the World Series of last year? Remember it was two out in the eighth and one man was on?"

If you showed these experts a chessboard for just a second and took it away, they could recall it completely. Show them an unorganized board and they didn't have any better memory of it than you or I. That is, their knowledge was organized in a very special way.

Now, bridge players show the same characteristics. They remember hands of bridge that are organized; they don't remember hands that are not. Radiologists have special kinds of knowledge. So do top-notch problem solvers in physics and expert baseball players. These people accrue an amazing amount of knowledge in a specialized area and organize it in a particular way, and that's the basis for their expertise.

Having known about that body of psychological research, and thinking about the skilled teachers I had worked with, I asked myself, "Do

these people I think so highly of have pedagogical knowledge comparable to a chess player's chessboard knowledge?"

I'm still in the middle of answering that question, but I am convinced that our early data say yes.

I'll give you one example. We've discovered that at the start of the school year, many experienced teachers do something that has been labeled "grooving the kids," which simply means that on opening day you have activities that make sure the students learn very quickly and well that *you* run the classroom and they don't. Give them assignments, have them fill out things. Now, our experts had never heard of the word "grooving," but they all held the knowledge that they had to take charge in some way. Our novices didn't quite understand that, and the postulants didn't have a clue about how to start off. This is a form of domain-specific knowledge.

You mentioned earlier your concern about allowing postulants to bypass pedagogical training and go directly into teaching.

We went into the study trying to shed some light on policy issues like that. If our work should reveal that there are experts on pedagogy just as there are experts in other fields, we might be able to provide the undergirding for the notion of a master teacher.

We are finding evidence that there are expert teachers; we're finding teachers who are unique in the way they process information—but we're also finding that our pool of experts, our pool of novices, and our pool of postulants do not separate out easily. We have some postulants who seem really sophisticated: who see more and think more deeply than one or two of our experts. It appears that some of our postulants could do well very quickly with perhaps five weeks of summer training under expert supervision. The majority, though, would not. They are well meaning, bright, and concerned people who simply don't know a lot—which is just what you would expect.

Your knowledge of research with experts in other fields enabled you to set up similar experiments?

Yes, we think so. For example, we've been trying to see if the memory of our experts is like the memory of chess experts. The chess experts are shown a chessboard and even though it's withdrawn quickly, they can recall all the pieces. We show our subjects a slide of a classroom where there's a science or math lesson going on. We flash it on the screen, take it away, and say, "What did you see?" Our novices would say, "I saw a man in a blue gray shirt with a brown tie." "I saw a boy with a book out." "I saw a girl with blond hair."

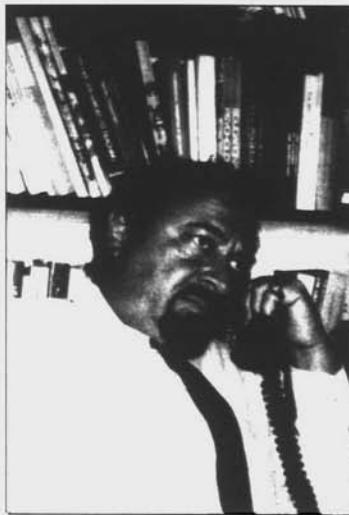
When we asked the experts what they'd seen they invariably answered at a higher level; they described the function. They'd say, "The end of the period. They're cleaning up." "It's a hands-on activity." That's a characteristic of experts—they have organized knowledge. Experts no longer merely see, they organize what they see into something more meaningful to them.

What else have you found about expert teachers?

Our experts are bothered by patterns they don't understand. One of our tasks is to show them a slide briefly, then show it again a second and third time. Each time we ask them what they have noticed, trying to see how they add information.

What they do is focus on abnormality. For example, some of the kids in one slide were looking at a particular area of the classroom. Almost all of our experts noticed it and kept looking for the teacher. None of our novices and postulants picked it up. That says to us that our expert teachers have pattern recognition skills similar to expert air controllers, who must know how to read a radar display. If something is out of whack, they spot it. They might not articulate it for a moment, but they know something is wrong and deal with it.

One of the tasks we're experimenting with is designed to see if expert teachers can process several sources



of specialized information simultaneously. The literature on experts says they should be able to. We set up a task in which the teacher has to monitor three TVs at once. Over on the left is a group of kids, on the right there's a group of kids, straight ahead is a teacher and another group of kids. The teacher is teaching a lesson on the digestive system using information on an overhead. The question was whether our experts, our novices, and our postulants could process from all three. It turns out our experts were absolutely unbelievable in doing so. Our first expert had no trouble watching all three screens at once and giving statements about things that were going on and, in fact, kept the sound up on all three screens, which I found absolutely impossible. The majority of experts not only could do it; they could make sense from it. The novices that we tested were very articulate but didn't have anywhere near the ability to process those three things simultaneously.

In one of our tasks we asked our experts, novices, and postulants to look over class materials—graded tests, textbooks, records, and roll book—on a fictitious class they were to take over in two days. The novices and postulants wanted to know about the kids. They read the student information cards carefully because they wanted to know who the bilingual kids were, the learning disabled, the smartest kids, the kids who were going to act out.

Our experts almost always skimmed the cards and put them away. They had no interest at all in comments made by other teachers about students because they have learned from many years of experience that kids behave differently in different classrooms. Rather than be biased in any way, the experts avoided the student records. Instead they focused on the tests; they wanted to find out what these kids knew.

I believe if we had larger samples and could design our studies better, we would find that the novices are concerned with where the holes are, while the experts take off from what kids know. One is a deficit model and the other is a strength model. Now, we have very small samples, so what I am saying is clearly intuitive, but I'm convinced that there is something to it. When they talked about how to start their classes, the novices and postulants wanted to test the students, while the experts preferred to talk with students to find out what they knew. The experts also have such a rich knowledge of subject matter and how it's to be taught that they are more confident. They don't need a test. They can ask a few questions and say, "Okay, they've an understanding of this aspect of ecology but not that. That's probably where the teacher left off."

The experts did another interesting thing. Almost all said they would start off the class by establishing new rules, new procedures, new ways of operating. The novices and postulants wanted to know how the former teacher ran the class so they could continue the system. The experts understood that they had to take control of the class in their own way.

It seems that some of the things you've mentioned might be matters of experience rather than real expertise.

We don't know yet how to carve out experience from expertise. We're quite sure that a person with many years experience is not necessarily an expert, but all our experts have ten years or so experience. In other words, experience is a necessary but not a sufficient condition for being an expert.

In psychological studies of expert physics problem solvers the criteria for being an expert are maybe ten years beyond the Ph.D., holding professor status at a university, working on research projects. The novice in such a situation might be a first-year graduate student. There you're talking about experienced-inexperienced and almost everyone is willing to say that's a pretty good way to get expert-nonexpert. None of us would say that in education.

One way to find out would be to ask some teachers who are experienced but not regarded as experts to do the same tasks.

Absolutely. If we had the money and time we could design it in, but our grant is a relatively small one and my time span is only two and a half years. It's an interesting problem: how does experience change people so that they become experts? Why do some experienced people not become experts?

What uses do you foresee for the kind of information you're gathering?

We have teachers who run the gamut. Some teach very interesting, unusual lessons. Others seem to excel because of the regularity of their management routines. They get a lot of work done and maintain a pleasant environment, but they certainly don't strike us as highly creative people. All the experts have lots of routines, by the way. The advantage of routines for experts, whether they are chess players or pilots, is that it puts things on automatic so their minds are free to do other things. When you know how to get the papers passed to the right or do the roll quickly or get in from the playground, you're free to think about your lessons.

I want to distinguish, by the way, between a good teacher and an effective one. Our notion of "effective teacher" is someone who meets a criterion. Our notion of "good teacher" has no criteria specified. Some might say, for example, the good teacher jokes around with the kids for a minute or two. When the bell rings she or he gets them on task quickly. When a lecture is started, it has an advance organizer. Good questions are asked. There's a review at the end. Now, there's every reason to judge that

performance as "good," but unless you know what was to have been accomplished and whether it *was* accomplished, there is no way to tell whether the teaching was "effective."

That's why you mentioned test scores earlier. But when you depend on outcome measures like test scores, you seem to be assuming that the tests we have are adequate measures of what we really want students to learn.

I'm only saying that for "effectiveness," there must be an objective standard. Good teaching is based on the norms and values of the observer, but to judge teaching as effective you have to have an outcome. It doesn't have to be a test outcome. You could say that the goal is cooperative learning and an effective teacher is one whose kids cooperate more at the end of the year.

What uses do you foresee for the kind of information you're gathering?

A very important part of teacher education is the student teaching experience, when we place the novice teacher with a "cooperating teacher" who is supposedly an expert. We've learned from our studies that some expert teachers can't articulate what they do. It turns out that there is a growing literature about that. The *Reflective Practitioner*, written by Donald Schon, describes experts in many fields who can't tell at all how they do it. Now, putting student teachers with such people—no matter how effective they are otherwise—is a big mistake. Novices can't learn from them. We hope our research will provide a better description of how experts act, and thereby provide a better language for describing this hard-to-articulate behavior.

There are lots of other uses. As we learn how the experts develop their mental roadmaps, we can use the information to clue in novices. We can say, "Why not work on your visual scanning?" "Why not try to automate the roll-taking routine?" And all our experts have refined their knowledge by reflective experience. Maybe we can help novices learn to concentrate on those things experts do so well.

Many of our members are supervisors of one kind or another. Are

there ways for them to use any of what you're learning?

One thing that may be helpful is to recognize that novices and experts think very differently. When you ask a figure skater how she switched from inside to outside of the blade, she hasn't got a clue, even though she does it beautifully. She may not even be sure why she does it anymore—because she mastered that 20 years ago when she was 5 years old. In other words, knowledge and action are different things. It's the old story of when you ask a centipede how it walks, it can't walk anymore.

That's why supervisors need to ask questions of beginning teachers that give the supervisor clues as to what the teacher is responding to. It's a slow, laborious process. Supervisors need to learn how their finest teachers operate and then try to unravel how teachers who are having difficulty think about the same phenomenon. I think part of supervision is learning how to unpack behavior: to open it up and try to figure out what the thought processes were behind it. As researchers learn more about the characteristics of experts, it may tell supervisors where to look.

For example, I'm already convinced that routines are a key element. From what we've found so far, one of the major distinguishing characteristics between excellent classroom teachers and less expert teachers is that the experts all have routinized large chunks of what goes on.

So supervisors might assist less expert teachers by helping them develop routines?

Yes. As I think back to teachers I've seen who were less than expert, one of the reasons had to do with their lack of regular procedures. Our experts can do a roll check in 30 seconds. They can get a homework review done in 75 seconds, while novices might take 10 minutes. Not only that, but as part of their homework review the experts can diagnose whether most of the class got it or not, meanwhile also finding out if certain kids are having trouble at home. The expert teacher often gets two kinds of information at once.

That leads me to ask whether your current research is leading you to

**rethink the findings you reported
in past years from the Beginning
Teacher Evaluation Study?**

Two of the major findings of the BTES were that effective teachers had good time management and made sure kids had a high proportion of successful experiences. Another was that they matched the curriculum to the intended outcomes. Our new research supports those earlier findings.

An interesting thing, though: our expert teachers all have very high time on task, but once in awhile they surprise us. They run with something for awhile but then stop and don't seem to care about efficiency. In every case they seem to know exactly what they want to accomplish and how to get it done, but there are so many variations in how they operate that it's hard to categorize.

**What does that say about the state
of research on teaching? How do
you assess what has been accom-
plished so far and where the field
is going?**

I think we've had an extremely fruitful 25 or so years. I say 25 years

because I date the modern research on teaching movement from publication of the first *Handbook of Research on Teaching* in 1963. That was our equivalent of Gray's anatomy.

We have identified a whole host of teacher behaviors and skills that are clearly related to achievement: pacing, structure, monitoring, feedback, certain kinds of questioning behavior. We have research on all sorts of academic climate variables. We know, in other words, what observable teacher characteristics are related to effective teaching. Now we want to go inside teachers' heads and ask them why they do the things they do.

For example, as I mentioned, a teacher whose students have more time on task will achieve more. Why then, on a given day, will an expert teacher simply throw the task out the window? All our correlations are based on the notion of stability of teacher characteristics—but every time we do reliability checks we know we're in trouble, because we keep finding the behavior of these expert teachers unstable from day to day and

year to year. Why? These are able, experienced people. There's something they are responding to that makes them change a routine that has worked perfectly 30 days in a row. They know something we don't. We'd like to find out what. □

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