

EDU 6526: Survey of Instructional Strategies
Session 3 Reading: Jerome Bruner

“Some Elements of Discovery”
by Jerome S. Bruner

Longtime Harvard University professor Jerome Bruner was one of the most distinguished educational psychologists of the twentieth century. He was the principal developer of the knowledge-centered curriculum Man: A Course of Study, from which some of the student examples in this reading are drawn. He argued persuasively that instructional results are limited when students merely study the formal outcomes or products of subject matter. In response to the objective behaviorism as advanced by B. F. Skinner, Bruner argued that to understand and influence the thinking of any individual, one must take into account the social and cultural context in which learning takes place. Instructional improvement, therefore, must engage with cultural influences that affect language acquisition and the understanding of concepts appropriate to the subject area and society. The following selection is from a larger essay that opens with his views about the significance in humans of cultural transmission. Bruner argues that “learning by discovery” is often the discovery of what is already known but properly developed it is no less significant.

It seems to be imperative for the child to develop an approach to further learning that is more effective in nature—an approach to learning that allows the child not only to learn the material that is presented in a school setting, but to learn it in such a way that he can use the information in problem-solving. To me, this is the critical thing: How do you teach something to a child? ... We talk about the child learning, or about programming the environment so he can learn, but I want to raise the following question: How do you teach something to a child, arrange the child’s environment, if you will, in such a way that he can learn something with some assurance that he will use the material that he has learned appropriately in a variety of situations. This problem of learning by discovery is the kind that guarantees a child will use what he has learned effectively.

We know perfectly well that there are good rote techniques whereby you can get the child to come back with a long list of information. This list is no good, however, because the child will use it in a single situation and possibly not even effectively then. There must be some other way of teaching so that the child will have a high likelihood of transfer. This problem of how to teach a child in such a way that he will use the material appropriately breaks down, for me, into six sub-problems.

First, is the attitude problem. How do you arrange learning in such a way that the child recognizes that when he has information he can go beyond it, that there is connectedness between the facts he has learned with other data and situation. He must have the attitude that he can use his head effectively to solve a problem, that when he has a little bit of information he can extrapolate information; and that he can interpolate when he has unconnected material. Basically, this is an attitudinal problem—something that will counteract inertness in that he will recognize the material that he has learned as an occasion for moving beyond it.

Discovery teaching involves not so much the process of leading students to discover what is ‘out there,’ but, rather, their discovering what is in their own heads. It involves encouraging them to say, Let me stop and think about that; Let me use my head; Let me have some vicarious trial-and-error. There is a vast amount more in most heads (children’s heads included) than we are usually aware of, or that we are willing to try to use. You have got to convince students (or exemplify for them, which is a much better way of putting it) of the fact that there are implicit models in their heads which are useful. ...[Y]ou must wait until *they* are willing to reflectively turn around before you begin operating with abstractions. Otherwise, they will become obedient

and noncomprehending. In time, the habit of or attitude toward reflecting on what you habitually do or say becomes well established. I put this matter first for I feel that it is the one thing that children most rarely encounter at school—that it is a good practice to *use* their heads to solve a problem by reflecting on what they already know or have already learned. Are college students so different from fifth graders?

Second is the compatibility problem. How do you get the child to approach new material that he is learning in such a fashion that he fits it into his own system of associations, subdivisions, categories, and frames of reference, in order that he can make it his own and thus be able to use the information in a fashion compatible with what he already knows. ... Let me give you a couple examples of this. One of the pictures [of tools] was of a compass—the kind that is used for drawing circles. One child, a particularly interesting one, was asked about it. What is that for? It's a steadying tool. What do you mean, a steadying tool? She went to the board.... You see, if you try to draw a circle, you're not steady enough to make a real circle, so a compass steadies you. The other children thought the idea was great and came forth with a stream of suggestions for other steadying tools. One suggested a tripod for a camera....

I was struck by the fact that they were doing something very much like Wittgenstein's description of concept formation. Recall his description of a game. What is a game? There is no obvious hierarchical concept that joins tennis and tag. What these children were doing with steadying tools was forming a concept in which neighboring elements were joined by "family resemblance," to use Wittgenstein's phrase. The concept that emerges is like a rope in which no single fiber runs all the way through. The children are getting connections that allow them to travel from one part of the system to the other and when something new comes in, they find compatible connections. You can, at your peril, call it association. By calling it that you forget the systematic or syntactic nature of their behavior... They were dealing with tools as governed by a rule of filling certain requirements—the different ways of getting steady or of holding things together. But the rules are not as simple as formal concepts. It is this kind of binding, this kind of exercise, that helps solve the compatibility problem, the problem of how to get a new piece of knowledge connected with an established domain so that the new knowledge can help retrieve what is likely to be appropriate to it as needed.

Third involves getting the child activated so that he can experience his own capacity to solve problems and have enough success so that he can feel rewarded for the exercise of thinking.

Fourth is giving the child practice in the skills related to the use of information and problem-solving. This is a highly technical problem that has to do not only with psychology but with learning those valuable short cuts within any field that we speak of as heuristics. ... Essentially, the tools of the mind are not only certain kind of response patterns, but also organized, powerful tool concepts that come out of the field he is studying. There is no such thing, to be sure, as the psychology of arithmetic, but the great concepts of arithmetic are parts of the toolkit for thinking. They contain heuristics and skills that the child has to master and the great problem here is how do you give the child practice in the utilization of these skills, because it turns out that however often you may set forth general ideas, unless the student has an opportunity to use them, he is not going to be very effective in their use.

... One of the skills is pushing an idea to its limit. Let me give you an example. A question came up in one of our classes of how to get information from one generation to another. One fifth-grader said that you did it by "tradition" and this empty formula satisfied most of the pupils. They were quite ready to go on to the next thing. I said that I did not quite understand what they meant by tradition. One child said that a tradition is that dogs chase cats. The others laughed. Well, the laughed-at boy responded, some people say it is an instinct, but he had a dog who did not chase cats until he saw another dog do it. There was a long silence. The children picked up the issue up from there, reinvented the idea of culture, destroyed the idea of instinct (even what is good about it), ended up with most of their presuppositions rakishly out in the open. Had I stopped the discussion earlier, we would have been contributing to the creation of passive

minds. What the children needed were opportunities to test the limits of their concepts. It often requires a hurly-burly that fits poorly the decorum of a schoolroom. It is for this reason that I single it out.

Fifth is a special kind of problem that I want to speak of as ‘the self-loop problem.’ The child, in learning in school settings, will very frequently do kinds of things which he not able to describe to himself. We see this all the time in our studies—namely, children who are able to do many kinds of things, for example, to handle a balance beam quite adequately by putting rings on nails on both sides of a fulcrum and getting quite interesting balances, but are not able to say it to themselves and convert this fact into a compact notation which they could hold in mind and push around. They can’t to use some barbarous computer language for a moment, develop adequate subroutines until they can get the responses right and describe them to themselves. [The baseball player] does not field a grounder in a certain way because he understands the differential equation of how the ball will move. Rather he is combining one act with another; using a sensorimotor skill fitted to the situation. But there is also a self-loop, a turning around on your own behavior, a chance for reflection. One goes from this skill at action to a deeper cognitive understanding. Various people have talked about this idea in different ways. I see it as a separate and special problem in discovery—discovering what it is that you’ve been doing and discovering it in a way that has productive power to it.

... We believe that by getting the child to explore contrasts, he is more likely to organize his knowledge in a fashion that helps discovery in particular situations where discovery is needed. I need not go into an elaborate justification of the method of contrast here, and will only note that its efficacy stems from the fact that a concept requires for its definition a choice of a negative case. Man is a different concept contrasted to standing bears, to angels, to the devil. Readiness to explore contrasts provides a choice among the alternatives that might be relevant.

In conclusion, let me take a very pragmatic position. Develop the best pedagogy you can. See how well you can do it. Then analyze the nature of what you did that worked. ... With a mixture of psychology, common sense, and luck you may produce an effect on learning that is worth studying.

From Lee S. Shulman and Evan R. Keislar, editors. *Learning By Discovery: A Critical Appraisal* (1966).

Bruner on school reform:

Getting to know something is an adventure in how to account for a great many things that you encounter in as simple and elegant a way as possible. There are lots of different ways of getting to that point, and you don’t really ever get there unless you do it, as a learner, on your own terms. All one can do for a learner en route to her forming a view of her own is to aid and abet her on her own voyage. The meaning for aiding and abetting a learner is sometimes called a “curriculum,” and what we have learned is that there is no such thing as *the* curriculum. For in effect, a curriculum is like an animated conversation on a topic that can never be fully defined, although one can set limits upon it. I call it an “animated” conversation not only because it is always lively if it is honest, but also because one uses animation in the broader sense—props, pictures, texts, films, and even “demonstrations.” So the process includes conversation show-and-tell plus brooding on it all on one’s own.

... I have no objection to creating better measuring instruments in order to find out how well our students are doing in science, in mathematics, in literature, in reading. For that matter, I don’t even object in principle to assessments of how well our teachers are doing their jobs. If you think that the poor performance of our educational establishment is due primarily to a failure in teacher evaluation or in student assessment, then such a reform movement would be appropriately

enough. Our state governors proclaim that... we will “turn things around” and be tops in the world in science and mathematics. And just what is it that is to be turned around? Assessment procedures and “standards”? If only that, then we will succeed only in fueling our internal indignation about how little geography our students know, how badly they read, how sorely lacking they are in mathematical skills, how deficient they are in understanding what science is about. Surely, that is a curiously indirect route to improving matters, indirect in the sense that the indignation just might conceivably lead us to do something further about how we conduct our schools and in the process of education generally.

It might even, conceivably, lead to a different message on public lips about financial support for schools and schooling. Schools are surely as important as the savings and loan industry that we proposed to “bail out” with a three hundred billion dollar handout. It might even lead us to question why, for example, we have made such an exclusive fetish of improving our record in science and mathematics rather than, say, concentrating our efforts as well on teaching our students about the politics and economies of the revolutionary world changes we are living through, or about why human nature risks it neck in the interests of freedom in Tiananmen Square in Beijing.... I am not against providing the nation with scientifically and mathematically literate workers so that we can outperform the Japanese or the new Europe in world markets—as if that aim alone could ever inspire either teachers or students. We forget at our peril that the great advances in Eastern Europe... were led not so much by mathematicians and scientists (though they were there too) but by playwrights, poets, philosophers, and even music teachers. What marks a Nelson Mandela or Vaclav Havel is human wisdom and philosophical depth. And so it was too with Thomas Jefferson; his vision was possible because he stood on the philosophical shoulders of John Locke and the learned men of the French Enlightenment.

Of course we need standards and resources to make our schools work will in solving the myriad tasks they face. But resources and standards alone will not work. We need a surer sense of what to teach to whom and how to go about teaching it in such a way that it will make those taught more effective, less alienated, and better human beings. The nation’s teachers have been struggling to carry out this daunting task and, under the circumstances, have been doing it with courage and skill against enormous odds. We in the universities and in the scientific and cultural institutions have been giving them precious little help. I am not proud to admit that much of the most strident recent criticism has come from such self-appointed guardians of the culture as Alan Bloom, who longs bitterly for an imaginary past while immured in his ivory tower. Teachers and schools, let it be said, did not create the conditions that have made American education so difficult. They did not create the underclass. Nor could they have undermined the research and development mission of competitive American industry anywhere as effectively as the greedy takeover tycoons fueled by junk bonds. Nor did they, like the money-churners and real-estate speculators, create the disgraceful condition of homelessness on one side and consumerism on the other, both now afflicting our economy and sense of purpose. Nor the drug problem, which Washington now proposes to solve not by capping the flow of drugs into the country or by destroying the home-grown drug cartels but, ironically enough, by giving the prevention task over to the schools.

What we need is a school reform movement with a better sense of where we are going, with deeper convictions about what kind of people we want to be. Then we can mount the kind of community effort that can truly address the future of our educational process—an effort in which all of the resources of the intellect and compassion that we can muster, whatever the price, are placed at the disposal of the schools. All the standards in the world will not, like a helping hand, achieve the goal of making our multicultural, our threatened society come alive again, not alive just as a competitor in the world’s markets, but as a nation worth living in and living for.

From Jerome Bruner, *The Culture of Education* (1996).