

November 1982

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Theories of Piaget, Who Died this Month, Inspire Growing Band of U.S. Professors

By Robert L. Jacobson

The death of Jean Piaget this month at the age of 84 came at a time when the Swiss psychologist's theories of cognitive development were inspiring a small but growing number of innovative instructional programs in American colleges and universities.

Most were started within the past few years and have yet to produce much hard evidence of their effectiveness. But participating faculty members say they are excited about what has been happening in their classrooms.

"Piagetian-based instruction," they say, offers many potential advantages over traditional methods: It facilitates communication, improves students' reasoning ability and academic achievement, boosts their self-confidence and interest in their work, and provides a practical basis for integrating different subjects in a curriculum through a common emphasis on cognitive skills.

Preliminary research findings indicate that students in such programs make significantly greater gains on tests of critical thinking than do their counterparts in other classes. Teachers also report that attendance is up and attrition is down for students in the special classes, which encompass many disciplines in both the sciences and the humanities.

"It's a movement that is coming in higher education," says one enthusiast.

So far about a dozen colleges are conducting formal Piagetian programs, while faculty members at a number of other institutions are believed to be drawing on Piaget independently in their teaching. The formal programs, which range from a single course to a full year of study, have attracted financial support from the federal government and private foundations.

4 Stages of Growth

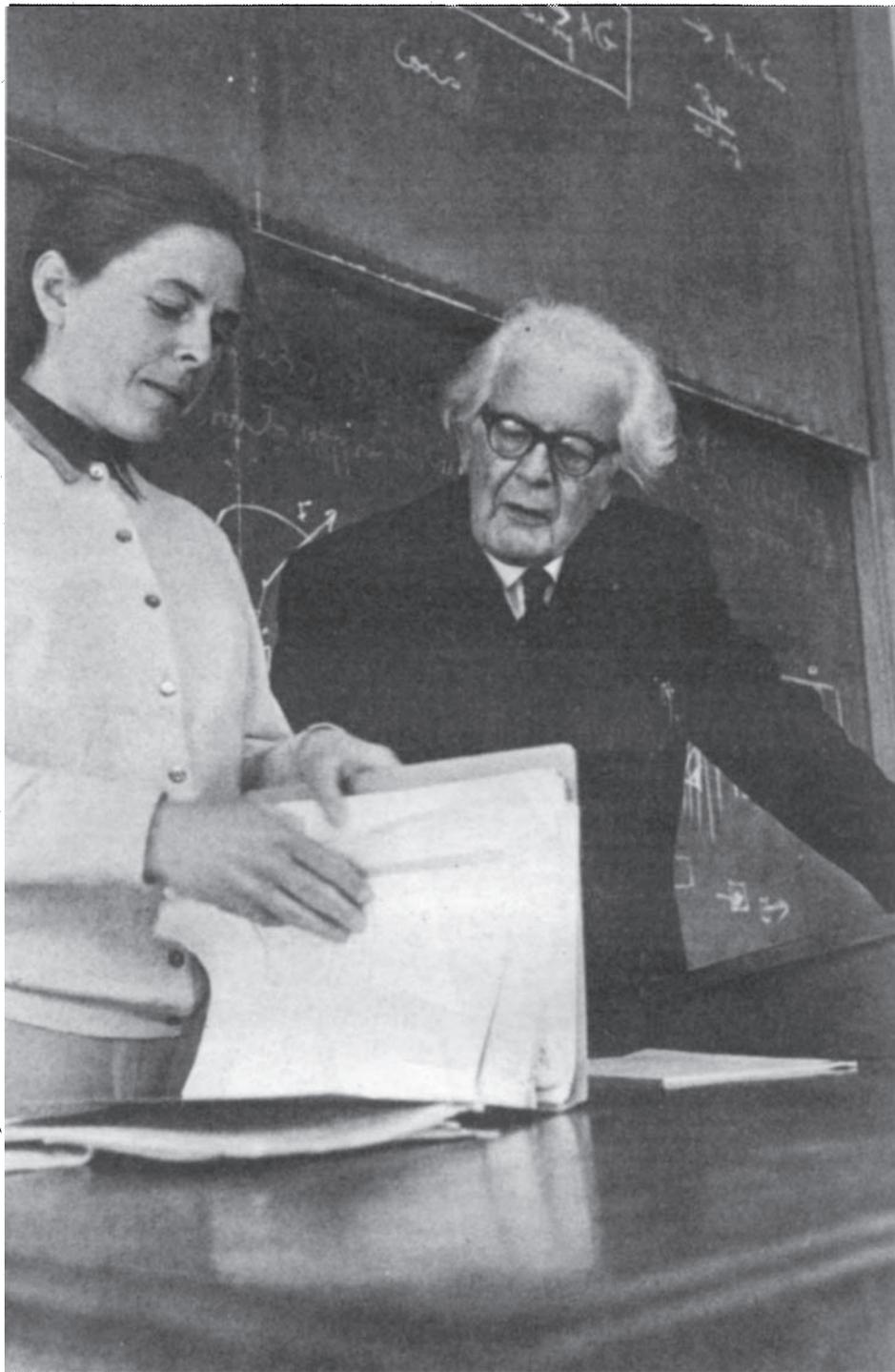
The underlying pedagogical principles stem from Piaget's conception of intellectual growth as comprising four stages that evolve in a person from birth to about age 16.

The first two stages—"sensory motor" and "pre-operational"—are usually over by the time a child is 8. The next two stages—"concrete operational" and "formal operational"—develop during the pre-teen and early adolescent years and encompass the reasoning patterns generally exhibited by high-school and college students.

Piaget observed that concrete thinkers could begin to deal logically with empirical data, manipulating symbols and organizing facts toward the solution of certain problems, but that they lacked the more advanced capacity of formal thinkers to reason hypothetically and consider the effects of different variables or possibilities outside their experience.

What holds particular significance for college teaching, according to Piaget's followers on the campuses, is his analysis of how people progress from concrete to formal thought.

In that process, known as self-regulation, an individual is confronted by new experiences that conflict with his previously held ideas and beliefs. He is thrown into a state of intellectual disequilibrium



The pedagogical theories of the Swiss psychologist Jean Piaget are gaining influence in American college classrooms.

that can be resolved only through adaptation and new patterns of reasoning.

The result is cognitive growth, or learning. The extent to which it takes place in the classroom, however, may well depend on the opportunities students are given to start with concrete experiences and find out for themselves which concepts work and which do not, Piagetians maintain.

They also make much of the realization, only recently supported by research, that as many as half of all college freshmen do not yet qualify as formal thinkers, but are still functioning at the concrete-operational stage in most subjects.

For those reasons, teachers in Piagetian programs take special pains to understand where their students are coming from intellectually and to guide them through a "discovery" approach to the topic at hand—a kind of learn-by-doing process quite different from the typical lecture method of college instruction.

The teachers concede that the Piagetian approach is time-consuming, and that some content may have to be sacrificed

for the sake of skills. But they see that as a worthwhile tradeoff. "My students," says one Piagetian, "work harder and remember more of what they study than students in regular classes."

According to Robert G. Fuller, a physics professor at the University of Nebraska at Lincoln who has pioneered the application of Piaget's theories to college teaching, the technique depends on the teacher's ability—and willingness—to "listen to students in their native language."

'Learning Cycle'

Mr. Fuller says that as he stands in front of his class he asks himself, "What's going on in the heads of all those people out there who are listening to me? If I ask my students some open-ended questions and listen to them, can I infer what kind of mental structures and problem-solving strategies they are using?"

Mr. Fuller is director of Nebraska's Piagetian program, which is known as ADAPT (for "Accent on Developing Abstract Processes of Thought") and is based on a

"learning-cycle" model developed by Robert Karplus, dean of the graduate school of education at the University of California at Berkeley.

The model was derived from work Mr. Karplus did in elementary science teaching in the 1960's and has been picked up by most of the other colleges offering Piagetian programs. It consists of three phases aimed at encouraging self-regulation: exploration of new materials, invention of concepts based on the students' experiences, and application.

As an example of how the model works in his physics classes, Mr. Fuller describes his "Planet Puzzle"—a collection of objects he uses to introduce the concept of density. He gives students 13 solids of different sizes and shapes, all painted the same color, and asks them to determine together which of the objects come from which of four different hypothetical planets.

Eventually, he says, after trying many original classification schemes, most of the students settle on a relationship of mass and volume.

Reconstructing an Essay

The same kind of instructional approach can be effective in non-science courses, Mr. Fuller says. He cites the work of a colleague who helps students improve their writing by giving them, on separate pieces of paper, each of the sentences of an essay he has written.

The students then seek to reconstruct the original composition by observing how the sentences are put together and relate to one another.

Mr. Karplus, who is also associate director of Berkeley's Lawrence Hall of Science, says he no longer believes in the actual existence of developmental stages of learning, but that, in terms of Piaget's relevance for college teaching, that is "beside the point," anyhow.

What does matter, he says, is that students need to become "active participants" in changing their own mental frames of reference so that their thinking and reasoning patterns become "more powerful and adaptive."

Mr. Fuller agrees. He says the key ingredient in ADAPT is that the students, all freshmen, are encouraged to "take responsibility for their own learning" instead of "just memorizing factual information."

Experiences, not textbooks or lectures, are at the heart of the ADAPT curriculum, he says, and students complete it with "a sense of ownership." The problem with traditional classes, he adds, is that teachers often "don't even scratch the kids" to determine whether they really understand a concept or are simply "spitting back" facts that mean different things to them and their instructors.

Beginning its sixth year this fall, the Nebraska program currently enrolls about 40 students in three courses—physics, English composition, and contemporary human values. Next spring it will offer courses in English, economics, and psychology.

These are some of the other Piagetian programs:

► DOORS ("Development of Operational
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Piaget

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Reasoning Skills") at Illinois Central College, a public two-year institution. Begun in 1977 with support from the federal Fund for the Improvement of Postsecondary Education, the program has 25 students in three courses—an introduction to social science, physics for non-science majors, and English composition.

► COMPAS ("Consortium for Offering and Managing Programs for the Advancement of Skills"), an offshoot of DOORS that is just getting under way this fall at six institutions—Joliet Junior College, Prairie State College, and William Rainey Harper College in Illinois, and the Community College of Allegheny County in Pennsylvania, Seminole Community College in Florida, and Surry Community College in North Carolina.

► DORIS ("Development of Reasoning in Science"), a supplementary course developed in 1977 by Francis P. Collea, chairman of the science education department at California State University at Fullerton. Taken so far by some 200 students, both science majors and non-science majors, the course is based on contributions from a physicist, a chemist, a geologist, two mathematicians, two psychologists, and two science educators. A proposal to add similar offerings in the social sciences and the humanities is pending.

► SOAR ("Stress on Analytical Reasoning") at Xavier University of Louisiana. The program is offered to beginning science students for six weeks in the summer before their freshman year. Director J. W. Carmichael, Jr., a chemistry professor, says it gives students a better chance to succeed in introductory math and science courses. Tentative research data suggest a sizable reduction in science attrition rates, he says.

► STAR ("Steps to Abstract Reasoning") at Colorado's Metropolitan State College. This interdisciplinary sequence for the freshman year was started in 1977 by members of eight departments—economics, English, geology, math, philosophy, physics, psychology, and reading. C. Rodney Killian, who coordinated the program last year, says 82 per cent of the first group of STAR students completed two semesters, compared with 67 per cent of the students in a control group. Organizational changes left STAR without official status this year, but the college expects to reinstitute a coordinated program next fall.

Further information about the various programs, as well as the theories behind them, is contained in a new 175-page book, *Piagetian Programs in Higher Education*, edited by Mr. Fuller of Nebraska. The book, which costs \$6 for one copy and \$5 each for five or more, is available from ADAPT, 213 Ferguson Hall, University of Nebraska, Lincoln, Neb. 68588.