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BENJAMIN BLOOM

1913–99

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About five feet five inches (1.65 m) in height, Ben Bloom was not a very large man, but his physical stature in no way reflected his presence in a room or the stature he achieved in the field of education. It was, I confess, a kind of anomaly to see someone who had few physically imposing qualities carry so much weight in a conversation and with so much of an aura.

Benjamin S. Bloom was born on 21 February 1913 in Lansford, Pennsylvania, and died on 13 September 1999. He received a bachelor's and master's degree from Pennsylvania State University in 1935 and a Ph.D. in Education from the University of Chicago in March 1942. He became a staff member of the Board of Examinations at the University of Chicago in 1940 and served in that capacity until 1943, at which time he became university examiner, a position he held until 1959.

His initial appointment as an instructor in the Department of Education at the University of Chicago began in 1944 and he was eventually appointed Charles H. Swift Distinguished Service Professor in 1970. He served as educational adviser to the governments of Israel, India and numerous other nations. These are some of the facts pertaining to his life and career. To know the man and his work, however, we must delve into what he stood for and what he accomplished as a teacher, a scholar and a researcher in the field of education. That is the story I would like to tell.

Bloom as a teacher

I had my first contact with Ben Bloom as a student in the Department of Education at the University of Chicago. He was one of my teachers. The course, and I remember it quite well, was entitled 'Education as a Field of Study'. Our aim in that course was to try to understand the kinds of questions that might be asked about the field of education and to explore the various ways in which those questions might be answered. It was a mixture of the conceptual analysis of a complex concept and an introduction to the forms of inquiry that would result in a research project. One aspect of the course focused on the use of statistics and the calculation of probability. The approach that Bloom took was to help us understand probability experientially. Unlike most instructors, who would be inclined to provide a theoretical explanation of the meaning of probability, Bloom had each of us toss coins and record the number of heads and tails produced in a number of trials. He then had the class combine their respective 'scores', which of course yielded a relatively smooth bell-shaped curve describing the distribution of occasions on which heads or tails appeared.

His willingness to devote the time in a graduate class to the actual production of an event in order to increase the meaningfulness of the idea of probability was emblematic of what always seemed to me to be a kind of hard-nosed progressivism that characterized his orientation to education and especially to the assessment of the educational consequences he thought important.

Bloom's strength as a teacher was not due to the fact that he was the most articulate on the faculty at Chicago at the time; he was not. It was not because he necessarily invented the most creative learning activities that graduate students might engage in; he did not. What Bloom had to offer his students was a model of an inquiring scholar, someone who embraced the idea that education as a process was an effort to realize human potential, indeed, even more, it was an effort designed to make potential possible. Education was an exercise in optimism.

Bloom's commitment to the possibilities of education provided for many of us who studied with him a kind of inspiration. He was, as I have indicated, an optimist, but an optimist who looked to the facts and who designed the studies to give substance to his aspirations.

I do not think I will ever forget being in a class of his in which the doctoral students enrolled were asked to present proposals for their dissertations or to describe pilot studies they had completed in preparation for their dissertation research. The weeks passed and it was my turn to present. My dissertation was to focus on the measurement of types of creativity displayed in two- and three-dimensional artwork made by children aged 10 and 11. The criteria for identifying each of the four types of creativity I had conceptualized were both complex and subtle; the tasks confronting the judges were to make judgements on subtle but important aspects of the creative features of the students' artwork. Alas, the inter-judge correlations turned out to be in the forties and there were some snickers from my peers when I put these coefficients on the blackboard. Bloom was slightly irritated by the responses of my fellow students and proceeded to the blackboard to show to my surprise and theirs how significant such correlations were in the light of the complexity of the tasks the judges were asked to perform. He taught me in that demonstration the importance of supporting students in difficult times and of putting statistics in context. How one interprets a set of numbers depends not only on matters of measurement but also on the characteristics of the situation from which those numbers were derived. That was a lesson I do not think I will ever forget.

Another feature of Ben Bloom's pedagogy most often emerged in one-to-one conversations in his office on the third floor of Judd Hall on the campus of the University of Chicago. His office was not an aesthetic delight. It had one wonderful black and white photograph of his mentor, Ralph W. Tyler, hanging on the wall. The rest of the office was strewn with books, papers, journal articles, and a sundry array of this and that having neither particular rhyme nor reason as far as I could tell. But it also had a large chalkboard, and it was in conversations on a one-to-one basis with Ben Bloom that one could experience his obvious pleasure in illustrating on the blackboard relationships that he expected to find or had already found in research. In these conversations the excitement of research-oriented inquiry was made palpable. It was clear that he was in love with the process of finding out, and finding out is what I think he did best.

The cognitive taxonomy

One of Bloom's great talents was having a nose for what is significant. His most important initial work focused on what might be called 'the operationalization of educational objectives'. As I have mentioned, Ralph W. Tyler was his mentor. When Bloom came to Chicago he worked with Tyler in the examiner's office and directed his attention to the development of specifications through which educational objectives could be organized according to their cognitive complexity. If such an organization or hierarchy could be developed, university examiners might have a more reliable procedure for assessing students and the outcomes of educational practice. What resulted from this work is *Taxonomy of*

educational objectives: Handbook 1, the cognitive domain (Bloom et al., 1956), a publication that has been used throughout the world to assist in the preparation of evaluation materials.

The cognitive taxonomy is predicated on the idea that cognitive operations can be ordered into six increasingly complex levels. What is taxonomic about the taxonomy is that each subsequent level depends upon the student's ability to perform at the level or levels that precede it. For example, the ability to evaluate—the highest level in the cognitive taxonomy—is predicated on the assumption that for the student to be able to evaluate, he or she would need to have the necessary information, understand the information he or she had, be able to apply it, be able to analyse it, synthesize it and then eventually evaluate it. The taxonomy was no mere classification scheme. It was an effort to hierarchically order cognitive processes.

One of the consequences of the categories in the taxonomy is that they not only serve as means through which evaluation tasks could be formulated, but also provide a framework for the formulation of the objectives themselves. Bloom was interested in providing a useful practical tool that was congruent with what was understood at that time about the features of the higher mental processes.

The publication of the cognitive taxonomy was followed by the publication of the affective taxonomy. Bloom's work was a signal contribution to mapping the terrain that educators were interested in developing.

Bloom's contributions to education extended well beyond the taxonomy. He was fundamentally interested in thinking and its development. His work with Broder (Bloom & Broder, 1958) on the study of the thought processes of college students was another innovative and significant effort to get into the heads of students through a process of stimulated recall and think aloud techniques. What Bloom wanted to reveal was what students were thinking about when teachers were teaching, because he recognized that it was what students were experiencing that ultimately mattered. The use of think aloud protocols provided an important basis for gaining insight into the black box.

Mastery learning

The features that characterize Ben Bloom's scholarship are several. First, as I have indicated, he was interested in understanding the ways in which cognition functions and, more important, how high-level forms of thinking can be promoted. Second, he had an abiding faith in the power of the environment to influence the performance of individuals. He was no genetically oriented determinist. His convictions about environmental influences led, ultimately, to the impact that his work had in establishing the Head Start Program in the United States. He was invited to testify to the Congress of the United States about the importance of the first four years of the child's life as the critical time to promote cognitive development. His testimony had an impact. Third, Bloom believed that not only was the environment important, but also that it was possible to arrange systematically the ways in which learning could be promoted. Mastery learning (Block, 1971), rooted initially in the work of John Carroll, is a good example of his effort and his abiding faith in the power of rationally defined goals to promote the attainment of those goals through instruction.

For at least a century, the way to approach the measurement and description of students' academic achievement had been to expect a normal distribution and then to compare students' performance. Those students who made the fewest mistakes or achieved the highest levels received A grades, while those somewhat less stellar in their performance received B grades. Most students received C grades, those less than average received D grades and those whose performance was not sufficient to achieve a pass were given an F grade. The assumption was that there would always be a normal distribution among students

and that this distribution and the students' location within it should determine their rewards—rewards distributed in the form of grades.

Bloom looked at the matter differently. Under the influence of Ralph Tyler he recognized that what was important in education was not that students should be compared, but that they should be helped to achieve the goals of the curriculum they were studying. Goal attainment rather than student comparison was what was important. The process of teaching needed to be geared towards the design of tasks that would progressively and ineluctably lead to the realization of the objectives that defined the goals of the curriculum. Mastery learning is an encomium to such a conception. The variable that needed to be addressed, as Bloom saw it, was time. It made no pedagogical sense to expect all students to take the same amount of time to achieve the same objectives. There were individual differences among students, and the important thing was to accommodate those differences in order to promote learning rather than to hold time constant and to expect some students to fail. Education was not a race. In addition, students were allowed, indeed encouraged, to help one other. Feedback and correction were immediate. In short, what Ben Bloom was doing was applying in a very rational way the basic assumptions embraced by those who believe the educational process should be geared towards the realization of educational objectives. He believed that such an approach to curriculum, to teaching and to assessment would enable virtually all youngsters to achieve success in school. The problem lay in curriculum design and in the forms of teaching that were appropriate to promoting the realization of the goals.

His convictions about the power of the environment to influence human performance are perhaps nowhere better illustrated than in his book *Developing talent in young people* (Bloom et al., 1985). In it he showed that even world-famous high-achieving adults—champion tennis players, mathematicians and scientists, award-winning writers—were seldom regarded as child prodigies. What made the difference, Bloom discovered, was the kind of attention and support those individuals received at home from their parents. Champion tennis players, for example, profited from the instruction of increasingly able teachers of tennis during the course of their childhood. Because of this and the amount of time and energy they expended in learning to play championship tennis, they realized goals born of guidance and effort rather than raw genetic capacity. Attainment was a product of learning, and learning was influenced by opportunity and effort. It was then, and is now, a powerful and optimistic conception of the possibilities that education provides.

It is important to note that in many ways Bloom's research on 'giftedness' undermines the typical conception of giftedness. 'Giftedness' typically connotes the possession of an ability that others do not have. A gift suggests something special that is largely the result of a genetically conferred ability. Like pregnancy, a gift is something you either have or do not have. While Bloom recognized that some individuals, idiot savants for example, had remarkable special abilities, the use of such a model of human ability converted the educators' role from inventing ways to optimize human aptitude into activities mainly concerned with matters of identification and selection. The latter process was itself predicated on the notion that cream would rise to the top. The educator's mission, Bloom believed, was to arrange the environmental conditions to help realize whatever aptitudes individuals possessed.

Furthermore, he recognized that there is hardly any human trait that is dichotomously distributed. Abilities are related to the kinds of interactions that individuals had with their environment and the development of appropriate environments is central to the realization of potentialities. Thus, giftedness was a concept that had problematic associations if it was seen essentially as a matter of all or nothing at all or if it defined the educator's role as that of someone concerned primarily with the identification of ability rather than with its

development. Again, Bloom's view of the realization of human ability presented an optimistic role for the educator.

Many of his students also studied the impact of environment on student performance. Dave (Dave, 1963), for example, studied the educational environment of the home and in attempting to account for differences in achievements between siblings discovered that one needed to talk not so simply about the educational environment of the home, but rather about the educational environment for particular people in the home. He found that parents often provided different opportunities and support because of different expectations for each of their children. What is provided and withheld impacts on what students are able to learn and do, not only at school but also in life outside school.

Privilege and performance

One of Bloom's most important works is his study of stability and change in human characteristics (Bloom, 1964). He found that it was possible to predict with considerable accuracy—around .8—the probable location, in a distribution of measured achievement, of the position of individuals from data on their performance obtained years earlier. By the second grade or at about the age of 7, the academic position of a student or students when they reached early adolescence could be predicted. Rather than regarding this stability as a manifestation of genetic determinism, what Bloom concluded was that such determinism could be undermined by effective teaching. By conceiving of the curriculum as a way to promote learning if organized sequentially and if supported by appropriate forms of instruction and variability in time, all students could be helped to achieve educational goals.

Bloom's view of learning is iconoclastic. Basically, his message to the educational world is to focus on target attainment and to abandon a horse-race model of schooling that has as its major aim the identification of those who are swiftest. Speed is not the issue, achievement or mastery is, and it is that model that should be employed in trying to develop educational programmes for the young. Mastery learning was an expression of what Bloom believed to be an optimistic approach to the realization of educational goals. The traditional expectations of a bell-shaped distribution of human performance was, more often than not, a reflection of social privilege and social class. Children who enjoyed the benefits of habits, attitudes, linguistic skills and cognitive abilities available to the more privileged members of society were likely to do well at school on tasks for which those attitudes and skills were relevant. To confer additional privileges on those who already had a head start was to create an array of inequities that would eventually exact extraordinary social costs. And since environment plays such an important role in providing opportunity to those already privileged, it seemed reasonable to believe that by providing the kind of support that the privileged already enjoyed to those who did not have it, a positive difference in their performance would be made.

Institution-building

Bloom's scholarship in education was complemented by his activism. By activism I mean that he played a major role in creating the International Association for the Evaluation of Educational Achievement (IEA) and in organizing the International Seminar for Advanced Training in Curriculum Development, held in Granna, Sweden, in the summer of 1971. His work in the IEA, since its inception over thirty years ago, has had a significant impact on the efforts being made internationally to improve students' learning in the dozens of countries that are members of the IEA.

What is striking about Bloom's views on international comparisons is that he was aware, perhaps more than most, of the complexity of student performance and of the danger of oversimplifying it on the basis of scores alone. One needed to know about much more than the magnitude of test scores in order to make educational sense out of them. One needed to understand the amount of time allocated to the study of the subject, one needed to understand the resources provided to schools, and one needed to understand the quality of teaching that was made available. Bloom was no mere number-cruncher. He understood full well that the environment matters and that the ability to interpret test scores without understanding the environment in which those scores were produced made no real sense at all. Alas, his admonishments about such matters have not always been heeded, bearing in mind the penchant in the United States to display league tables of school performance.

His efforts in the curriculum field to improve the quality of student learning received a major push in the curriculum development seminar held in Sweden in 1971. Teams from over thirty countries participated in that seminar. Individuals from these nations more often than not had little background in the curriculum field and often used materials and approaches to teaching in school that seldom required more than forms of rote learning. The relevance of differences among students, differences in geographical and physical context, and differences in forms of pedagogy was seldom considered as nations cranked out uniform syllabi that provided little assistance to teachers with respect to how curriculum content might be organized and how teaching might proceed.

The seminar on curriculum development was intended to provide a substantial boost to empower those with limited training in curriculum development. Furthermore, with such exposure, team members from the nations in attendance were expected to return to their countries at the end of the six-week seminar to build curriculum centres by means of which more effective materials and pedagogical approaches could be developed. Bloom saw the seminar as a way to begin a process of institution-building, the institution of the National Curriculum Center. Centres in Israel and in India are examples of the fruits of his leadership in this domain.

Institution-building for Bloom was not restricted to institutions away from home. In the Department of Education at the University of Chicago, he almost single-handedly developed the MESA (Measurement, Evaluation and Statistical Analysis) programme. This programme was designed to prepare scholars who had the quantitative and analytical skills to think through in great depth what needed to be addressed in order to design genuinely informative and educationally useful evaluation practices. The alumni of this programme are currently stars in the system. The genius of the programme was that it never confused statistical and educational significance. Always at the forefront were questions having to do with the educational value of what was being addressed; Bloom's students were no mere technicians. His commitment to the possibilities and potential of education as an exercise in optimism infused his views about how young scholars should be prepared in the field of evaluation.

Ben Bloom's activism and leadership in education did not stop with his major contributions to the IEA. Nor did it stop with the Seminar for Advanced Training in Curriculum Development. It went beyond the organization of the MESA programme in the Department of Education at the University of Chicago. He also served as chairman of the research and development committees of the College Entrance Examinations Board and was elected President of the American Educational Research Association in 1965. Scholars recognized the stature of this physically small man from Chicago and honoured him with appointments, honorary degrees, medals and election to office. He had a nose for the significant, and he had the rare ability to formulate research problems that responded to what he believed to be significant.

Ben Bloom not only provided a model of scholarship, he also provided to those who had the good fortune to work with him a kind of inspiration, an opportunity to see someone deeply engaged in the satisfactions of his work and infinitely convinced of the possibilities of education. He left an imprint that will not soon erode. The field of education, and more important, the lives of many children and adolescents are better off because of the contributions he made.

Note

1. *Elliot W. Eisner (United States of America)* Lee Jacks Professor of Education and Professor of Art at Stanford University. He has lectured throughout the world on the development of aesthetic intelligence. His major publications include *The enlightened eye: qualitative inquiry and the enhancement of educational practice* (1991), *Cognition and curriculum reconsidered*, 2nd ed. (1994), *The educational imagination: on the design and evaluation of school programs*, 3rd ed. (1994) and *The kind of schools we need* (1998). He studied at the School of the Art Institute of Chicago, the Institute of Design of the Illinois Institute of Technology, and the University of Chicago. He has served as president of the National Art Education Association in the United States, the International Society for Education Through Art, the American Educational Research Association and the John Dewey Society.

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