Doublethink in Biological Education

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THE CONCEPT OF "DOUBLETHINK" was introduced in George Orwell's novel *Nineteen Eighty-four* (1949). In the world of Big Brother, Doublethink is the ability to hold two contradictory beliefs in one's mind simultaneously, and accept both of them. The party member in this scenario is exposed, from early childhood, to mental training based on this concept, so that by the time he assumes his role in the party he is, understandably, unable and unwilling to think too deeply on any subject whatever. This system, if it is to work, demands uniformity—of dress, of speech, and, most important, of thought. The most serious crime against the state is Thought-crime, which consists in not thinking along the lines approved by the state.

If one critically examines some of the common practices in undergraduate biology today, it is hard to avoid the conclusion that, educationally, we are a lot closer to the world of Big Brother than we want to admit. It should be pointed out, however, that biological education cannot be considered in a vacuum; rather, it must be placed in the context of the whole educational endeavor and of the larger society that supports it. Thus, many of the problems of biological education must be shared by the whole educational establishment. However, this in no way reduces the responsibility of biology teachers to seek solutions to the problems.

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To get back to the concept of Doublethink: let us first examine some of the fond hopes we like to express for the behavior of our students and then compare these hopes with the methods we are using to evoke these behaviors. High on the list of expectations must be the hope that we will develop in our biology students the ability to think independently. This goal has been stated in various ways: to develop the ability to think critically, to develop intellectual honesty, to develop an inquiring mind, or to develop the ability for self education. These are all varieties of the same concept, which we can call intellectual autonomy.

The Core-Curriculum Straitjacket

Let us examine the methods we are using to develop intellectual autonomy in students, and let us begin with the curriculum. There is an entity in biological education known as the core curriculum. This usually takes the form of a collection of courses that are required of all biology majors. A core curriculum was defined by a CUEBS panel (1967) as "that body of knowledge essential for all students of Biology." This statement is so omnipotent that one hesitates to fool around with it, but let's do so anyway.

It is not unusual to find biology programs in which students can exercise freedom of choice in only one or two courses; and in some instances the whole undergraduate program is prescribed and required (Cox and Davis 1972). The usual rationale given for this is that students are incapable of planning programs that will best fit their needs. (Actually, most core curricula are designed to prepare the student for graduate school.) In the absence of competent counseling this may, in fact, be the case, but this whole issue raises a very basic question: What is school for? Almost everyone will agree that the prime function of school is to give the student something that will be useful to him in the future. If it does not prepare students for the future, one must question the whole idea of school. The existence of a required curriculum thus suggests that the faculty can foretell the future better than the student. A census of the number of Ph.D.s pumping gas in the past few years suggests that our batting average at foretelling the future is not all that could be desired.

What are the consequences of abolishing the core curriculum? It would give the student the right and the responsibility to make critical decisions with regard to his education. At worst, the student may make mistakes in judgment, which he will have to learn to live with. However, this is an improvement on having to learn to live with someone else's (the faculty's) mistakes. Besides, a good case can be made for the educational value of learning to live with one's own mistakes. Most important: a rigid, required curricular structure stifles intellectual autonomy by submerging the individual, forcing all

students into a common mold, and introducing an assembly-line effect into biological education. It appears, then, that the practice of requiring a curriculum is incompatible with our goal of developing intellectual autonomy. However, we continue the practice: Doublethink.

The Archaic Lecture–Laboratory Format

Next, let us examine the teaching methods that we are using to develop intellectual autonomy in students. Almost universally in this country, undergraduate biology is presented in the lecture–laboratory format. The main function of the lecture is to transmit information; of the laboratory, to illustrate the subject matter presented in the lecture. The laboratory experiences usually consist of prefabricated exercises with standardized procedures and predetermined outcomes. Let us take a closer look at these functions of the lecture and the laboratory.

Lecturing as a means of transmitting information became obsolete with the invention of the printing press, in the 15th century. In comparison with the books, journals, films, computers, and teaching machines available today, lecturing is a very inefficient way to transmit information. (This does not negate the fact that there are other valid functions of the lecture; see the Toronto report [Presidential Advisory Committee 1967].) In addition, lecturing has several undesirable side effects. A major one is that it deprives the student of virtually all responsibility for using his own mind to weigh, compare, and decide what is important for him to learn. If one of the aims of biological education is to develop intellectual autonomy, then students must be given an opportunity to *exercise* intellectual autonomy.

Sometimes it is difficult to motivate students to exercise intellectual autonomy. I teach a course in general ecology for biology majors—a course that is presented as a series of self-instructional modules. Each module has clearly stated instructional objectives. Recently, a student complained that she did not know what was expected of her in the course. When the explicit nature of the instructional objectives was pointed out to her, she admitted that she was accustomed to having the teacher *tell* her the important things to learn. Subsequently, she dropped the course.

This is an example of what was meant earlier by the statement that many of the problems of biological education are shared by the whole educational establishment. The reader may be surprised to learn that there are public schools that administer tranquilizing drugs to "hyperactive" children, so that, among other things, they will listen to the teacher. Chorover (1973) states: "I doubt that anyone really knows how many American children are being treated with daily doses of [drugs]. One practitioner who uses them estimates that the number exceeds 250,000 nationwide." Chorover says further: "We are laying the groundwork in childhood for the psychotechnological control of adults. As the tools grow more powerful, the prospects are vanishing for saving our children and for saving ourselves from this dehumanizing chemical and biological warfare."

The young woman referred to earlier was not a victim of drug abuse in the public schools; but she has become addicted to the teacher, through normal classroom practices. It is unconscionable even to think about a college population that has been preconditioned to intellectual passivity by drugs. In my judgment, a great many—perhaps most—college students are already addicted to, and are overdependent on, the teacher. Compare this situation with the goal of developing intellectual autonomy. It seems to be another clear-cut case of Doublethink.

Lockstep Laboratory Instruction

Let us now examine traditional laboratory instruction. The fact that in many biology courses the lecture and the laboratory are scheduled as separate entities suggests that there are aspects of biology that cannot be pursued in the lecture. Chief among these are the processes by which biological information is generated. Prefabricated laboratory exercises, in which the student follows a set of detailed directions to arrive at the "right" answer, do little to enhance his understanding of these processes. Striving for predetermined "right" answers brainwashes the student into a false concept of the way biological information is derived: we all know there are no "right" answers but only varying degrees of probability. Furthermore, this technique has the effect of standardizing and depersonalizing the laboratory experience, so that all students are performing uniform tasks in the same ways and at the same rates.

Unfortunately, it seems that few biologists have addressed themselves to the basic questions of what constitutes a valid laboratory experience, and what is the optimal laboratory experience for a given course. In practice, there seems to be a form of Parkinson's Law operating, to the effect that the number of laboratory exercises performed by students increases in direct proportion to the number of laboratory periods available. The prevailing assumption seems to be that a prescribed number of hours in the laboratory results in an equal learning experience for all students. In reality, an intensive two- or three-week period of investigation is a better learning experience for some students than a full semester of "official answer" exercises. The point is that learning is an individual process and cannot be treated with assembly-line, mass-production techniques. When it is so treated, the student's individuality is submerged, and he is reduced to jumping through academic hoops.

Conventionally taught biology courses are, typically, instructor-centered, in the sense that they

provide the student with little opportunity for self-initiated and self-directed study. McKeachie (1970) cited research reports indicating that learning is strongly influenced by teaching methods. These reports show that for the achievement of more complex educational outcomes, such as long-term retention, critical thinking, changes in attitude, and motivation—all of which are part of intellectual autonomy—student-centered teaching methods are superior to instructor-centered ones. Thus, the lecture–laboratory format as traditionally used is antithetic to the goal of developing intellectual autonomy.

What Do Letter Grades Measure?

Another practice that biological education shares with the whole educational establishment, and which is contradictory to the development of intellectual autonomy, is the practice of giving letter grades. Letter grades have been defended on the basis that they give a measure of academic achievement. However, this is circular reasoning, because academic achievement has no independent meaning; it is defined in terms of grade-point averages. In practice, each instructor has his own interpretation of academic achievement for each course he teaches. In the grading process, he may evaluate student performance on a variety of activities—oral and written expression, laboratory performance, class attendance, and other activities—he considers relevant. These are then summarized on a single scale and issued as a letter grade. The grade, however, gives no information about the evaluation that led to it; and the information it does transmit is difficult or impossible to interpret.

Grade-point averages have been used for such varied purposes as admission to graduate and professional schools, scholarship awards, determination of draft status, eligibility for veterans' benefits, eligibility for extracurricular activities, and qualification for employment. It seems absurd to even suggest that each of these purposes requires the same kind of information. That they are so used suggests that grades mean everything to everyone. One is tempted, therefore, to accept the opposite: that they really mean nothing, because "When no meaning is conveyed variation in meaning cannot be observed" (Warren 1971).

When instructors are required to turn in grades ranking the relative accomplishments of students within the time limits of a college term, they commonly, and arbitrarily, choose a body of information that they think will fit the time period. The information and learning activities are then organized so that grades can be determined in the simplest way. In order to get a better comparative measure, this often means that all students do the same things in the same ways and at the same time. Thus, individual rates of learning become secondary to the bureaucratic requirements of grading. The result is that getting good grades in courses becomes more important than learning.

Ironically, there is evidence that giving grades has a negative influence on the learning process. Psychologist Edward Deci (1972) reported on experiments indicating that when students were either rewarded (as with an "A") or punished (as with a "D" or an "E") in a learning situation, they showed less interest in the learning task after it was completed than did students who had performed the task for their own satisfaction, when no reward or punishment was involved.

Grades have become so firmly established in American education during the past 50 years that both students and teachers have developed a great dependency on them. We persist in identifying our best with "A"s and "B"s, on the assumption that the letters identify those who will become the leaders of our society. But this does not appear to be the case. The Newman report (Task Force 1971) indicated that a number of studies of students trained in business, school-teaching, engineering, medicine, and scientific research had found almost no correlation between course grades of students in these fields and their on-the-job performance.

It is important to emphasize the distinction between grading and evaluation. One of the essential functions of school, as an institution, is evaluation (Postman and Weingartner 1973). By definition, in the absence of evaluation you do not have a school. (In much the same way, without guards you do not have a prison). Faculty evaluation of student performance, however, can be accomplished without recourse to any system of grading. In fact, as we adopt more open curricula in which the emphasis is on self-initiated learning, evaluations of learning situations are likely to include summary statements about the student's progress and performance, along with samples of his work. This is by no means a new and revolutionary idea. The transcript of students graduating from Evergreen State College will consist of a 32-page booklet. This will comprise a much more meaningful record than a symbolic one consisting of letter grades. Some instructors may give brief and uninformative evaluations, but it is hard to imagine an evaluation summary more brief and uninformative than an "A" or "B" or "C". The practice, then, of giving letter grades, while professing to develop intellectual autonomy in students is another example of Doublethink in biological education.

Avoiding Big Brother's World

All of the practices that have been described here—curricular structure, traditional use of the lecture–laboratory format, and grading—are nothing more than conventions used by biology departments and schools to achieve their goals. Conventions can be changed without destroying the basic

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functions of these entities. That conventions can change is illustrated by reforms carried out at Evergreen State College, Governor's State University, and Hampshire College. These are new schools, which started off with different conventions. Whether or not the existing educational establishment can change its conventions is a moot question.

It is not likely that changing the traditions of established institutions will be easy. However, the one sure way to avoid the world of Big Brother is to have a citizenry of autonomous thinkers. If biology departments and schools have the slightest commitment to the future, it is imperative that they change some of their conventions. Not to do so is, in effect, a denial of the goal of developing intellectual autonomy.

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