ENGLISH IN THE SCIENCE COURSE*

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THE Spens Report distinguishes three main purposes of English teaching: the first, "to enable a child to express clearly, in speech or writing, his own thoughts and to understand the clearly expressed thoughts of others"; the second, "the development of the power thus acquired to benefit the child as a social being, and to help him take his place as a thinking individual and a wise citizen"; and the third, "the training in the appreciation of literature". This division provides a useful basis for discussion, though it must of course be recognized that we are often, consciously or unconsciously, aiming at more than one of these objectives simultaneously. Indeed, the consideration with a class of any vital piece of literature should call into play both clear expression and comprehension, understanding of the subject-matter and literary appreciation.

I should like at the outset to deal with the vexatious matter of overcrowded time-tables. Science is a perpetually growing and expanding study; and though this may be, educationally, a stimulating and valuable thing, it is becoming a real difficulty to the administrators. Much of the work which was once done at universities is now delegated to the secondary school. The situation is becoming serious on the medical side, and real attempts are at last being made to meet it. But unless science teachers can discard old knowledge as rapidly as new truths are discovered there seems to be no real solution to the problem. It is easy enough in most other subjects; once we have grasped the geographical truth that the earth is round, we have not added to our curriculum, since there is no serious reason why we should continue to devote lessons to explaining that it is flat. And language study and even history can select for educational purposes from a field which, however far it extends, will never be too large for them. But science demands a knowledge of the whole, since (unless I am misinformed) it does not admit of short-cuts or arbitrary selection; it is moreover a practical study, which involves long periods in laboratories and considerable sacrifice of spare time. So it is not surprising that the young scientific worker is always in danger of over-specialization.

To my mind the minimum of non-scientific work a science specialist should do in a thirty- to thirty-four-period week is between ten and twelve periods: two of scripture, two of physical education, three or four of English, and three or four of a modern language. He should also have enough spare time to follow some non-scientific hobby, music or art or something of that nature. I have called this a minimum, but it is, I fear, a minimum very seldom attained and scarcely ever exceeded.

Up to the school certificate there is a blessed compulsion laid upon us all to keep the curriculum broad, and English normally gets its fair share of attention. But where other subjects are handicapped merely by the unfamiliarity of their context (whether this be Greek characters, French verbs, algebraical symbols or chemical formulæ) English has to struggle against the much more dangerous fact that most of those who are taught it think they know all about it already. Ideally, the first object of English teaching, training in simple expression and comprehension, should have been attained before the children reach the specialist stage. But this is not so, and often the young students who start on their special science course with a first certificate of general educational proficiency tucked into their pocket are in most cases incapable of expressing themselves clearly, either orally or on paper, and liable to make complete nonsense of a closely reasoned paragraph of simple prose.

One of the smart things to say about this business of teaching expression is that every master is an English master, and that teachers of other subjects ought never to pass slovenly or badly written answers. This is admirable doctrine; but there are two difficulties. The first is that it assumes that this part of English teaching can be done by a non-specialist (yet would the science teacher trust the English teacher to teach anyone even the rudest elements of science?). The second is that when the science teacher asks questions he is concerned to get answers which are right in substance; credit is given—and rightly—for accuracy in matter of fact, and the quality of expression must be a secondary consideration. Moreover, whereas in language teaching English style comes to its own in all translation work, mathematics and science deal largely with symbols and not with words. The science master's main opportunity comes in requiring descriptions of experiments; this is admirably designed to test clear and accurate statement, since slipshod explanation defeats itself. Yet beyond correcting obvious errors and pointing out how defective expression distorts or obscures the truth, the science teacher as such can do little; he has not the time and it is not his job. Yet if he will just do this he is assisting the English teacher more than he realizes; for he has helped to break through the water-tight compartments between one school 'subject' and another, and taught his pupil (who always pays more attention to his specialist teacher than to any other) that good English is a means to something beyond itself.

The main fact remains, however, that the English master can neither assume that his pupils have been taught to express themselves and understand anything beyond the simplest books in their earlier years, nor delegate this part of his duty to the science department, though he will hope for its co-operation. He must do the work himself. How then will he do it?

Partly, I think, by direct and formal instruction in syntax, grammar, punctuation and style; there are several ingenious books available which make these things palatable, and the teacher should be quick to seize any opportunity of using an odd five minutes in some such exercise. Indirectly, too, in the correction of essays or answer papers, he will have chances of directing attention to the pupil's besetting sins and suggesting remedies. These sins are of varying degrees of seriousness, and in some cases betray secrets of deeper disorder. Bad spelling may be carelessness or lack of observation or an eradicable and sometimes inherited disease; but there is nothing inherently vicious in it. Mistakes of grammar and syntax indicate a misspent youth and a slovenly habit of speech. A clumsy style suggests a lack of æsthetic sensibility and a lumbering mind. But none of these are so depraved as the commoner failing of bad punctuation, which is the sure reflection of inaccurate and slipshod thought. Commas and semi-

* Substance of the presidential address at the annual meeting of the Science Masters' Association held at Rugby School during April 8–11.

colons are as much part of the expression of an idea as the words in which it is embodied. They are not (as often seems the case) condiments to be sprinkled freely over the completed paragraph.

Oral expression should not be forgotten, though there is all too little time for it.

Hand-in-hand with expression goes comprehension. Boys learn to read very many years before they learn to understand, and considerable practice is needed before they can be relied on to extract the meaning from any but the simplest passages. Many of them cannot follow a set of instructions or the steps of a straightforward argument, so it is not surprising that they show such helplessness when confronted by a fairly stiff passage of Shakespeare or one of the more elementary official publications. Much here depends on practice, which is all the more valuable since you cannot test comprehension without giving training in expression as well. All good first school examinations include a précis, but this useful exercise tends to drop out of the curriculum later. Yet there is nothing like it for testing three most important things: first, the ability to realize what the writer means; secondly, the power to distinguish between the essentials and non-essentials in the matter presented; and finally, the art of expressing the gist of it in clear, simple prose.

The second and more important stage of English instruction is "the development of this power [of comprehension and expression] to benefit the child as a social being, and to help him take his place as a thinking individual and a wise citizen". The distinction between this and the previous stage is one of emphasis rather than of method or subject-matter. From the beginning there must be some care taken in the choice of the material for the English lesson; comprehension and expression cannot proceed *in vacuo*. But as the boy gets older we should be free to consider more and more not only how he expresses his thought but what his thought is like and how it is developing and expanding; and at the same time we should be demanding of him a deeper comprehension and a critical examination of the thoughts of others.

There will of course be scope for his thought and his critical power in his specialist work, but now that psychologists have more or less agreed that there is considerably less transfer of training than was once supposed, we cannot assume that an understanding of grammatical or biological variations will show itself in a clear grasp of political or moral distinctions. It is notorious that many men of outstanding ability in their own field have gone sadly astray when they have moved out of it. The same failure to transfer ability from one subject to another is found in all spheres of knowledge, and we must therefore not imagine that when we have taught a boy to make accurate deductions or detect fallacies in his own subject he will be able to do so in all. Still less, of course, can we introduce him to the material of other branches of study by means of his own special subject. It is here that English, which is for us the connecting medium between all our diverse little worlds, comes into its own.

We have already demanded ability to express and to understand simple ideas; we might go on to say that an educated man should have achieved some general philosophy of life and have accumulated some information about the world in which he lives. He should know roughly how it is arranged spatially and the broad outlines of the experiences it has gone through in the past two thousand years. He should be able to think politically, and have some convictions on questions of ethics and community life. Most of us would of course go much further than this, but here at any rate is a minimum for our consideration. How far in our English course are we helping boys to achieve the end desired?

The first necessity is to arouse their interest, which can be amazingly hard to do. The more absorbing a subject, the more it tends to fill the horizon; and the more frequent and searching the examinations, the less time there is for the cramped student to stretch his arms and grow to his full stature. "Born a man and died a grocer"; that is the epitaph of all those whose one aim in life is to go on knowing more and more about less and less. My experience as one of the board of interviewers for county major scholarships has revealed some rather dark corners of the educational field. Some of the candidates who have come before us, not infrequently those who are the most brilliant in their own subject, have never lifted up their heads to sniff the breeze and see the stars. They prate happily to us of the laborious progress they are making towards their next examination, confess at times to a mild fondness for the pictures or a penchant for draughts; at times they bicycle for exercise and are occasionally known to dig up weeds. But their world is sealed and they are comfortably at ease within it. The War has now, in its third year, battered a little rudely at their peace, but that after all is an interruption which in time will pass. But as for politics in the deeper sense, philosophy, mountain-climbing, music, literature, long walks in moonlight, baths in sunlit streams, social problems, art, the blessed frenzy of argument, passion, adventure, God Himself—try them where you will and the bland, blank smile of polite boredom is your only answer.

This is of course a caricature, but like all caricatures it suggests a truth; and with all deference I must go on to say that almost all those candidates to whom it applied were specialists in science. It is not that science is in itself a narrowing study; but it demands so much time, and the standard required for success in examinations is so high, that literary, political, ethical, historical, philosophical and cultural interests all have to give way.

If we are to interest boys and girls in subjects to one side of their main line of advance, we must show them how necessary it is for them to explore the roads which lead to them. We must ask questions of them, questions which seem to them (as well as to us) to be important, questions to which they are anxious to know the answers. The mere unloading of information is of itself unappetizing, unless it either is immediately relevant to their particular subject, or comes in response to a demand. It follows that we should probe them a little, try to find by judicious inquiry where their imaginations are not dead but merely sleeping. If they have learnt at all to read (and courses of silent reading lower in the school should help towards this) we can discover which way their minds have been moving by letting them write an essay on any subject (other than science) under the sun. This for a start; it may give us a line of approach. Class debates and informal discussions will test them further; once their interest is on the move it should be kept spinning by any and every means, by provocation, by challenge, by illustration, by trenchant criticism, by genuine sympathy. But if the teacher, from his

eminence, thinks fit to be superior or sarcastic or condescending—then small wonder if our young scientist returns gladly to his laboratory, thinking with savage glee as he completes his analysis how hopelessly lost his English master would be inside those sacred walls.

All this does scant justice to those few young scientific boys who have been among my own keenest and best-informed English pupils in the past few years. But it must be confessed they were the exception, and that both in quantity and quality the essays on political or general subjects shown up to me by my Science VIth have compared badly with those from the Classical or Modern sides. There are three stages through which young writers normally pass: that in which their essays are too short, because they have little to say; that in which they are too long because they cannot control their material; and that (reached only by the few) in which they have suited their length to their subject, having learnt to select and arrange both their thoughts and their words. Too often I find that, while I have to wade through vast compositions by young historians and modern linguists who have reached the stage of verbosity and cannot emerge from it, the comparative brevity of their scientific brethren is due more often to their having failed to pass out of stage one than to their having graduated into stage three.

Training in the appreciation of literature is a chancy business; it depends more than almost any other co-operative activity upon the nature of the two parties to the operation and upon the *rapport* between them. But if the pupil is to make our great heritage of literature his own he must both be sensitive himself and sit—at some stage in his career—at the feet of one of the chosen votaries of Apollo. All too often he enters upon his specialist course in none too congenial a mood. He may well have suffered under the meticulous dissection of a play of Shakespeare and the minor poems of Milton by a teacher whose horizon was bounded by contexts and classical allusions and the percentage required for a credit. In this teaching the teacher must be sincere, both in judgment and in enthusiasm. The teacher must also be sincere in criticism, such as frank recognition of Shakespeare's ludicrous failures as well as his triumphs. Such teachers win respect, and respect for them is half-way to interest in their enthusiasms. The second suggestion I would make is that here as in the earlier stage much can be done by asking questions which excite a desire to know the answer.

It is not for everyone to find in literature their chief delight. But we shall do our pupils wrong if we do not endeavour to reveal to them all what abiding happiness can be found in the company of great writers. This is after all the crowning achievement of the English teacher. To ensure moderately clear expression is much, and the first step to creating an intelligent electorate. To awaken interest in social, political and moral questions, this is more, and an enrichment of the life of man. But to open the doors of the imagination, this is best of all. For we are all of us, scientist and humanist alike, citizens of two worlds; and nothing that happens in this unhappy, tortured planet where man is at enmity with man can altogether overwhelm one who has heard the lute of Orpheus, or thrilled to the passion of Romeo, or looked with startled eyes through Keats's casements upon the foam of perilous seas.

THE SCIENCE MASTERS' ASSOCIATION

ANNUAL MEETING AT RUGBY

THE first full annual meeting the Science Masters' Association has been able to arrange since the outbreak of war was held at Rugby School during April 8–10, under the presidency of Mr. Hugh Lyon, headmaster of the School. The success of the meeting justified the venture; more than two hundred members were resident in school Houses, and many others made daily visits. The lectures were stimulating, discussions fruitful even when they developed unexpected trends, visits of particular interest, and the members' exhibition as good as any of its predecessors.

A liberal education draws its energy from many sources. It is a narrow kind of humane education which neglects the study of natural science; but it is a sterile form of scientific training which takes little regard of human relationships. The presidential address on "English in the Science Course" (see p. 454) and the biennial Science and Citizenship Lecture on "Biological Instruction and Training for Citizenship" given by Prof. Lancelot Hogben left the mind open to the wider views of life.

Biology and Citizenship

Prof. Hogben aimed high. He endeavoured to approach the great national and political problems caused by the impact of science on society. At the start of his lecture he cleared the air for what followed by examining the ideal of knowledge for its own sake.

Knowledge for its own sake presumably means knowledge for the sake of the individual, the pursuit of knowledge for the satisfaction of personal curiosity; and it goes without saying that individual curiosity is a necessary condition for the growth of knowledge. To that extent knowledge for its own sake is a formula which directs attention to a legitimate aspiration and to a sound educational principle. Most of us, including those alert to social agencies which provide scope for personal curiosity, would readily concede that personal interest in a particular line of inquiry or instruction depends on circumstances which do not necessarily or commonly have a close connexion with its social usefulness. Few of us imagine that precocious concern for the remediable evils of malnutrition determines the choice of a career in biochemistry. What we do assert is that a society more alert to the problems of malnutrition would furnish more ample opportunities for biochemical research and instruction. We find it difficult to understand why biochemistry should suffer from the efforts of those who wish to promote greater public esteem for the work which biochemists carry out; and we are not convinced that a person who professes supercilious indifference towards the welfare of his fellow-citizens is on that account a better biochemist.

If they mean anything at all, this seems to be what people suggest when they make knowledge for its own sake a battle cry in the discussion of science teaching in relation to citizenship. There is nothing particularly scientific about the egocentric attitude which refuses to recognize social relations as data relevant to personal conduct. That we are members of a social group is an inescapable fact. To what extent we get opportunities and encouragement to