logically correct and complete algorithm for solving a problem? Perhaps the Sixth Form student who has written a realistic program for helping complete our school timetable, who worked evenings and nights and got bored with correcting mistakes caused by imperfect equipment, could be credited with both tenacity of labour and the ability " to concentrate on work which is not necessarily interesting or tasteful ". Is there also an implication that using a computer enables us to avoid real work? Using a computer to solve a problem demands a real and profound understanding of the problem and gives the student worthwhile practice in logical thinking: by removing from the student the burden of arithmetic, the computer enables him to concentrate on the important work—the analysis of the problem itself. In designing an algorithm, the student has to solve a class of problems, not one individual problem.

Organisation and planning are certainly vital and nowhere more vital than when using computers. Visits to computers can be of value, but unless something really positive is done with computers by the students, such visits tend to have the same value as a group of English pupils spending a weekend in Paris with no knowledge of French between them. Similarly I cannot follow Mr. Marchant's implication that studying computer methods and mechanics (which incidentally many Sixth Form students can do better than their teachers) need detract from either their fluency in English or their ethics. My computer is not my hobby nor is it a luxury hobby for the students in Havering, it is a basic tool in a variety of academic and general courses and is vital to some valuable educational research.

Mr. Marchant has used many evocative phrases and loose implications to link computer education with a lowering of standards in many spheres but should our educational thinking return to a kind of " leaky shoe " policy held by John Locke? Discomfort does not always make children healthy, boredom does not necessarily make them wise and a refusal to face the future does not mean that the really valuable things in education can be preserved.

Yours faithfully,

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DEAR SIR,—I wish to take up a point raised by A. J. M. Spencer in the *Mathematical Gazette*, Volume LI, October 1967, concerning the alleged failure of those new Technological Universities which have developed from former Colleges of Advanced Technology, to offer the right kind of training in undergraduate mathematics to those of its students who are seeking an industrial career in mathematics.

So far as this University is concerned, we have a four year sandwich course in Technological Mathematics, many of the students being industry-based. In addition to the traditional courses which they receive in pure and applied mathematics, the students have a sound training in what the writer has styled management-type subjects (i.e. computer sciences, statistics, operational research, systems analysis) and also in engineering mathematics. It is on the last named that I want to deliberate.

In their first year, our students attend courses in the Mechanical Engineering Department in which they are taught the elements of the strength of materials and they are also given some training in mechanical drawing. In other years they receive courses from a mathematical engineer who is a member of the Mathematics Department, and who has had many years experience in research and development in a large electrical engineering firm with which he still has contacts in a consultative capacity. These courses include the treatment of eddy currents (as arise in transformers and various electrical machines), theory of linear graphs and integral transforms together with their applications in electrical and mechanical engineering.

As regards the more traditional applied mathematics, we instruct our students in dynamics, electromagnetic theory, elasticity theory and fluid dynamics. Certainly much time is spent on illustrative problems having precise analytic solutions, but the topics are taken beyond this stage. Thus, for example, in the courses on fluid dynamics there is more time being spent on supersonic and viscous flows and on shock waves than on the more classical hydrodynamics of ideal fluids. Recently some magnetohydrodynamics has been brought into the final year course as some mathematicians are now founding careers in plasma physics laboratories and in radio and radar research establishments where the study of cosmic electrodynamics is of some interest.

Problems are often discussed at the " crude " stage and also the attendant approximations that are to be made. Every attempt is made to keep syllabuses up-to-date and to look to future developments. Thus, for example, the students are trained to formulate some physical and engineering problems by means of integral equations rather than by differential equations, since the former permit greater accuracy in computation.

Final year students at Aston, as at Nottingham, undertake project work. I may cite several typical projects which have an engineering inclination (in addition to the management-type): design of supersonic wind tunnels and nozzles; study of eddy currents in electrical machines, circuit topology; gas dynamics of the motion of turbine blades; applications of Pontryagin's optimisation principle in elasticity, fluid flows and rocket motion; study of shock waves; problems in elasticity and plasticity including the use of a photoelastic bench; study of long-range rocket orbits and space technology, etc.

The connections of the Mathematics Department with industry have recently been strengthened through the appointment of a Visiting Professor who works on gas turbine technology in a large Midlands firm. Also we have just started an M.Sc. course, with two options, one in statistical subjects and the other in engineering mathematics which latter continues the pace set in the undergraduate course.

Yours faithfully,
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