2

Answer four questions.

1. (a) What is meant by the term diffusion?
   (b) Describe how you would set up an experiment to find out if a membrane is permeable to water but not to glucose.
   (c) Briefly explain how and where in the body glucose passes through membranes.

2. (a) Make a diagram to show the structure of a moveable joint. Give the functions of the parts you label.
   (b) Explain what is meant by: (i) a sprain; (ii) a fracture;
   (iii) a dislocation.
   (c) Why is correct posture important in maintaining good health? [4, 10, 11]

3. (a) What is a pulse in a human being?
   (b) In what ways would you expect the pulse rate and the breathing rate to vary with the amount of physical activity being undertaken by an individual?
   (c) How do you explain the reasons for the variations in (b) above?
   (d) Why is regular exercise thought to be important for a person's health? [8, 9, 9]

4. (a) Make a diagram of all of the alimentary canal that lies beneath the diaphragm.
   (b) Label only those structures which take part in digestion.
   (c) Indicate clearly on your diagram: (i) where hydrochloric acid is secreted;
   (ii) where bile is stored;
   (iii) where most amino acid absorption occurs.
   (d) How is energy gained and how is it lost by the body? Explain how the net result may lead to obesity. [3, 6, 6, 10].

5. Describe, naming an example where possible, what is meant by five of the following:
   (a) alleles;
   (b) mutation;
   (c) sex linkage;
   (d) continuous variation;
   (e) fraternal (non-identical) twins;
   (f) mosaic. [5 x 5]

6. (a) What is meant by the term ovulation?
   (b) What hormonal changes occur during the menstrual cycle?
   (c) Assuming a cycle is 28 days, state, giving your reasons, the probable fertile part of the cycle.
   (d) How is this knowledge of the menstrual cycle used in effecting contraception? [4, 8, 6, 7]

7. (a) Give an account of the processes by which water in urban household sewage is returned to the environment in an unpolluted state.
   (b) Briefly state why it is necessary for the body to have a regular intake of water. [15, 10]

8. Explain clearly and briefly the effects on the human being of five of the following:
   (a) smoking tobacco;
   (b) drinking alcohol;
   (c) too much stress;
   (d) insufficient insulin secretion in the body;
   (e) insufficient vitamin C in the diet;
   (f) injection of a vaccine. [5 x 5]

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Figure 1. Paper 2 of the Oxford GCE O-Level in Human Biology, Summer 1984. The 'health-related' questions are asterisked. (Reproduced by permission of the Delegacy of Local Examinations, University of Oxford.)

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‘Measuring’ health education: health-related topics in the GCE

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It is suggested that the status of health education within the school curriculum is handicapped by the substantial ‘non-examinable’ component. However, imparted knowledge, which is measurable, can certainly influence health-related behaviour. In this article, the writer assesses how effectively health-related knowledge was examined in a recent O-Level paper, and suggests that a GCSE Mode III paper in this area of the curriculum is a practical possibility.

There are three areas or domains which may be explored in the evaluation of health education programmes. They are:

1. The cognitive: The gain and use of knowledge, including the development of intellectual skills.
2. The behavioural: Changes in behaviour which result from awareness and the gaining of knowledge.
3. Affective: The development of attitudes and feelings.

Conventional written GCE examinations, particularly in biological subjects, tend to assess the cognitive achievements of the pupils: questions which ask for easily-recognised patterns of responses are set, and these are marked with a high degree of consistency by a team of examiners. The importance of behavioural change, and the development of values, attitudes, and feelings, is being recognised more and more; but public examinations which can yield consistent statistical evidence of performance have not yet been devised. Thus, the analysis of results of conventional examinations in, for example, Human Biology and Social Biology, do not of themselves tell us much about the processes that have gone on in the classroom, although they do tell us about the pupil's ability to score in the examinations.

Even so, this assessment of knowledge and its application may be a useful indicator. Knowledge gained today may be applied tomorrow. Knowledge usually precedes insight into concepts, and hence into attitude and behavioural change. Human behaviour is complex, and, without wishing to sound trite, many approaches contribute to the total synthesis.

Health education in the curriculum

Unfortunately, the syllabus content of examination boards is often controlled by the assessment procedures available.
Thus in Human Biology courses fundamentals such as concepts of love, sexual behaviour, and making choices are not included because of the problems of examining them.

In secondary schools, pressures from the 'examinable' curriculum often preclude a separate health education programme; but subjects offering health-related topics within a GCE or CSE course can contribute considerably to an overall health education programme, especially in the 4th and 5th years. In the biological sciences, even if the approach is not experimentally based, courses can offer much to the personal and social development of pupils - much will depend upon the teacher, who may contribute to the 'preventative' or 'educational' models. (1)

In fact, aspects of health education may be covered in a wide range of subjects in schools. Contributions which different subjects may make at GCE and CSE level have been researched and reviewed by Jones & Hill (2). But Human Biology holds a central position among all others as a subject upon which much health education can be built, and if syllabuses also contain studies of the environment, they can add considerably to the total health-related package.

The Oxford Human Biology syllabus
This syllabus contains many areas that are health-related (3). Designed to meet some of the needs and interests of students in contemporary society, to contribute towards their general education, and to help prepare them for responsible adulthood, the examination sets out to measure, amongst other things, the attainment of the candidates in their ability to
1. Apply knowledge to familiar situations, e.g. the need for hygiene.

2. Understand aspects of human behaviour referred to in the syllabus, which lead to good health.

There will always be the problem of deciding upon material that is health-related. Much of the syllabus could be regarded as health-related in the widest sense, but this will depend upon the attitudes of the teacher and the pupils. In this paper, health-related is chosen in a narrow sense, and includes only those areas which can easily be identified as relevant.

Two sections of the syllabus are particularly health-oriented: Section 3 (Health and disease), and Section 4 (Man's Place in the Environment). The syllabus gives many opportunities for the good teacher to be informative, and to enable pupils to build value judgments.

Investigating the candidates' performance
A sample of 820 candidates' marks were analysed, and the results of Paper 2, which is less structured than Paper 1, are presented here. The paper, which is illustrated on page 52, consisted of eight equally-weighted questions, of which candidates were asked to attempt four. Questions 2c, 3c, 4c, 6, 7, and 8 were considered to be markedly health-related.

It is easy enough to write a prototype question on any topic, but it can be a considerable step from this stage to a 'useful' question, and a paper is likely to contain questions of different quality in this respect. In deciding the usefulness of the selected questions as indicators of health knowledge, it was necessary to apply two criteria:

1. **Facility** - how hard was the question to answer? (The higher the value, the easier the question.)

2. **Discrimination** - how well did the question separate the better candidates from the others? (The higher the value, the better the question.)

*Facility can easily be calculated in a paper where all the questions are obligatory, by dividing the mean mark for the question by the maximum mark obtainable for that question. It can be expressed as a decimal or a percentage. Where there is a choice, as in this analysis, the calculation is more complex, as brighter candidates may choose particular questions. In Table 1, facility is calculated from the formula

\[ F = \frac{M_p(S) + M_q(S)}{M_q(V) - M_q(V)^2} \]

\[ \text{here } M_p = \text{mean mark for the paper as a whole} \]

\[ M_q = \text{mean mark for the question} \]

\[ M_q = \text{mean mark for the paper for those candidates attempting that question} \].

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### Table 1. The performance of 820 candidates in Paper 2 of the Oxford GCE O-Level in Human Biology, Summer 1984.

<table>
<thead>
<tr>
<th>Question</th>
<th>No. of attempts</th>
<th>Topic area</th>
<th>Mean mark</th>
<th>Facility (%)</th>
<th>Discrimination</th>
</tr>
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<tbody>
<tr>
<td>1a</td>
<td>229</td>
<td>Diffusion</td>
<td>10.5</td>
<td>0.32</td>
<td>0.62</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>Osmosis experiment</td>
<td>52</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>Glucose movement</td>
<td>25</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>613</td>
<td>Joints</td>
<td>12.3</td>
<td>0.29</td>
<td>0.44</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>Joint/bone damage</td>
<td>51</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>Posture</td>
<td>26</td>
<td>0.28</td>
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<tr>
<td>3a</td>
<td>581</td>
<td>Pulse</td>
<td>11.2</td>
<td>0.41</td>
<td>0.56</td>
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<td>Effect of physical activity</td>
<td>72</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>on pulse</td>
<td>31</td>
<td>0.47</td>
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<tr>
<td>d</td>
<td></td>
<td>Exercise</td>
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<tr>
<td>4a</td>
<td>487</td>
<td>Alimentary canal</td>
<td>72</td>
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<tr>
<td>b</td>
<td></td>
<td>Digestion</td>
<td>62</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>Secretion</td>
<td>47</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td></td>
<td>Energy and obesity</td>
<td>32</td>
<td>0.31</td>
<td></td>
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<tr>
<td>5a</td>
<td>159</td>
<td>Alleles</td>
<td>10.0</td>
<td>0.41</td>
<td>0.62</td>
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<tr>
<td>b</td>
<td></td>
<td>Mutation</td>
<td>33</td>
<td>0.37</td>
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<tr>
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<td>Sex linkage</td>
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<td>e</td>
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<td>Fraternal twins</td>
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<tr>
<td>f</td>
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<td>Meliosis</td>
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<tr>
<td>6a</td>
<td>377</td>
<td>Ovulation</td>
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<td>b</td>
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<td>Menstruation</td>
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<td>0.54</td>
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<tr>
<td>c</td>
<td></td>
<td>Fertile part of cycle</td>
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<tr>
<td>d</td>
<td></td>
<td>Contraception</td>
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<td>7a</td>
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<td></td>
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<td>8a</td>
<td>615</td>
<td>Smoking</td>
<td>10.9</td>
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<tr>
<td>b</td>
<td></td>
<td>Alcohol</td>
<td>47</td>
<td>0.30</td>
<td></td>
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<tr>
<td>c</td>
<td></td>
<td>Stress</td>
<td>27</td>
<td>0.006</td>
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<td>d</td>
<td></td>
<td>Insulin</td>
<td>32</td>
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<tr>
<td>e</td>
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<td>Vitamin C intake</td>
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<tr>
<td>f</td>
<td></td>
<td>Vaccines</td>
<td>29</td>
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</tbody>
</table>
A 16+ health-orientated syllabus?

With the demise of the GCE in 1987 and the planned arrival of the GCSE in 1988, there will be different opportunities for teaching Human Biology. The new courses available should have more time for experimetal work and discussion, and teachers will play an important role in the final assessment. If they wish to extend the areas of health within the new GCSE, no doubt some regions: examination boards will be sympathetic about accepting a Mode III in Human or Social Biology, especially when a group of schools in an area can agree upon a syllabus.

The present doubt surrounding the introduction of the GCSE, and the pressures on teachers caused by industrial action, may make it difficult to contemplate such an initiative at the present time. But it is, potentially, a golden opportunity to promote the status of health education as an 'examinable' subject. I shall be most interested to hear from any teachers interested in taking the Human Biology/Health Education proposal a stage further.

References


What do 11-year-olds know about heart disease?

David Wallwork

Ailwyn Community School
Ramsey, Cambridgeshire

The writer suggests that teachers may not be taking sufficient notice of the health-related knowledge or beliefs that children bring into the classroom. Twelve interview studies with 154 pupils confirmed his view that these could be substantial. What may be lacking, however, is the ability to find links between these packages of information. 'I would contend that it is these links which shape behaviour, and that this is the area that we as educators should be looking at carefully.'

Organising the study

The study was based on a series of semi-structured interviews with groups of 11-year-old pupils in Cambridgeshire secondary schools. I decided that the interviews would need a focus and for this reason I put together a four-minute videotape, which included snippets of advertisements, drama, and sports activities. I included some reference to all the factors thought at present to cause heart disease, (diet, exercise, stress, and obesity). Reference to these factors was not always obvious, and sometimes more than one was suggested at the same time - for example an obese runner completing the London marathon.

I asked the teachers of the children concerned not to prepare them in any way, except to say that a visitor was coming who wanted to talk with them. The interviews were carried out in normal scheduled science lessons, wherever possible with no other adults present. I chose to interview groups rather than individuals because I wanted my work to be of obvious relevance to the teacher in the