Teaching Physics in the UK...

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Thought this would be of interest on sci.physics...Found on uk.education.maths...

Sorry state of affairs...

> A physics teacher begs for his subject back: An open letter to AQA and The Department of Education
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> http://tinyurl.com/2xlj26
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> http://www.wellingtongrey.net/
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> I am a physics teacher. Or, at least I used to be. My subject is still called physics. My pupils will sit an exam and earn a GCSE in physics, but that exam doesn't cover anything I recognize as physics. Over the past year the UK Department for Education http://www.dfes.gov.uk/ and the AQA board http://www.aqa.org.uk/ changed the subject. They took the physics out of physics and replaced it with. something else, something nebulous and ill defined. I worry about this change. I worry about my pupils, I worry about the state of science education in this country, and I worry about the future physics teachers − if there will be any.
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> I graduated from a prestigious university with a degree in physics and pursued a lucrative career in economics which I eventually abandoned to teach. Economics and business, though vastly easier than my subject, and more financially rewarding, bored me. I went into teaching to return to the world of science and to, in what extent I could, convey to pupils why one would love a subject so difficult.
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> For a time I did. For a time, I was happy.
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> But this past academic year things changed. The Department for Education and the AQA board brought in a new syllabus for the sciences. One which greatly increased the teaching of `how science works.' While my colleagues expressed scepticism, I was hopeful. After all, most pupils will not follow science at a higher level, so we

should at least impart them with a sense of what it can tell us about our universe.

That did not happen

The result is a fiasco that will destroy physics in England.

The thing that attracts pupils to physics is its precision. Here, at last, is a discipline that gives real answers that apply to the physical world. But that precision is now gone. Calculations − the very soul of physics − are absent from the new GCSE. Physics is a subject unpolluted by a torrent of malleable words, but now everything must be described in words.

In this course, pupils debate topics like global warming and nuclear power. Debate drives science, but pupils do not learn meaningful information about the topics they debate. Scientific argument is based on quantifiable evidence. The person with the better evidence, not the better rhetoric or talking points, wins. But my pupils now discuss the benefits and drawbacks of nuclear power plants, without any real understanding of how they work or what radiation is.

I want to teach my subject, to pass on my love of physics to those few who would appreciate it. But I can't. There is nothing to love in the new course. I see no reason that anyone taking this new GCSE would want to pursue the subject. This is the death of physics.

Specific Complaints:
My complaints about the new syllabus fall into four categories: the vague, the stupid, the political, and the non−science.

The Vague:
The specification provided by the AQA (available at their website) is http://aqa.org.uk/qual/pdf/AQA−4462−W−SP−08.PDF vaguely worded. Every section starts with either phrase 'to evaluate the possible hazards and uses of.' or 'to compare the advantages and disadvantages of.' without listing exactly what hazards, uses, advantages or disadvantages the board actually requires pupils to learn. The amount of knowledge on any given topic, such as the electromagnetic spectrum, could fill an entire year at the university level. But no guidance is given to teachers and, as a result, the exam blindsides pupils with questions like:

Suggest why he [a dark skinned person] can sunbathe with less risk of getting skin cancer than a fair skinned person.

To get the mark, pupils must answer:

More UV absorbed by dark skin (more melanin)
Less UV penetrates deep to damage living cells / tissue
Nowhere does the specification mention the words sunscreen or melanin.

It doesn't say pupils need to know the difference between surface dead skin and deeper living tissue. There is no reason any physics teacher would cover such material, or why any pupil should expect to be tested on it.

The Stupid:
On topics that are covered by the specification, the exam board has answers that indicate a lack of knowledge on the writer's part. One questions asks `why would radio stations broadcast digital signals rather than analogue signals?' An acceptable answer is:

Can be processed by computer / ipod [sic]
Aside from the stupidity of the answer, (iPods, at the time of this writing, don't have radio turners and computers can process analogue signals) writing the mark scheme in this way is thoughtless, as teachers can only give marks that exactly match its language. So does the pupil get the mark if they mention any other mp3 player? Technically, no. Wikipedia http://en.wikipedia.org/wiki/Category:Digital_audio_players currently lists 63 different players. Is it safe to assume that the examiner will be familiar with all of them? Doubtful.

If the question is not poorly worded, or not covered in the specification, it will be insultingly easy. The first question on a sample paper started:

A newspaper article has the heading: 'Are mobiles putting our children at risk?' A recent report said that children under the age of nine should not use mobile phones.

The first question on the paper was:

Below which age is it recommended that children use a mobile phone in emergencies only?

This is the kind of reading comprehension question I would expect in a primary school English lesson, not a secondary school GCSE.

The Political:
The number of questions that relate to global warming is appalling. I do not deny that pupils should know about the topic, nor do I deny its importance. However, it should not be the main focus of every topic. The pupils (and their teachers) are growing apathetic from overexposure.

A paper question asked: `Why must we develop renewable energy sources.' This is a political question. Worse yet, a political statement. I'm not saying I disagree with it, just that it has no place on a physics GCSE paper.

Pupils are taught to poke holes in scientific experiments, to

constantly find what is wrong. However, never are the pupils given ways to determine when an experiment is reliable, to know when an experiment yields information about the world that we can trust. This encourages the belief that all quantitative data is unreliable and untrustworthy. Some of my pupils, after a year of the course, have gone from scientifically minded individuals to thinking, "It's not possible to know anything, so why bother?" Combining distrust of scientific evidence with debates won on style and presentation alone is an unnerving trend that will lead society astray.

The Non−scientific:
Lastly, I present the final question on the January physics exam in its entirety:

Electricity can also be generated using renewable energy sources. Look at this information from a newspaper report.

The energy from burning bio−fuels, such a woodchip and straw, can be used to generate electricity.
Plants for bio−fuels use up carbon dioxide as they grow.
Farmers get grants to grow plants for bio−fuels.
Electricity generated from bio−fuels can be sold at a higher price than electricity generated from burning fossil fuels.
Growing plants for bio−fuels offers new opportunities for rural communities. Suggest why, apart from the declining reserves of fossil fuels, power companies should use more bio−fuels and less fossil fuels to generate electricity.
The only marks that a pupil can get are for saying:

Overall add no carbon dioxide to the environment
Power companies make more profit
Opportunity to grew new type of crop (growing plants in swamps)
More Jobs
None of this material is in the specification, nor can a pupil reliably deduce the answers from the given information. Physics isn't a pedestrian subject about power companies and increasing their profits, or jobs in a rural community, it's is about far grander and broader ideas.
http://www.powersof10.com/

Conclusion:
My pupils complained that the exam did not test the material they were given to study, and they are largely correct. The information tested was not in the specification given to the teachers, nor in the approved resources suggested by the AQA board. When I asked AQA about the issues with their exam they told me to write a letter of complaint, and this I have done. But, rather than mail it to AQA to sit ignored on a desk, I am making it public in the hope that more attention can be brought to this problem.

There is a teacher shortage in this country, but if a physicist asked

my advice on becoming a teacher, I would have to say: don't. Don't unless you want to watch a subject you love dismantled.

I am a young and once−enthusiastic physics teacher. I despair at what I am forced to teach. I have potentially thirty years of lessons to give, but I didn't sign up for this − and the business world still calls. There I won't have to endure the pain of trying to animate a crippled subject. The rigorous of physics been torn down and replaced with impotent science media studies.

I beg of the government and the AQA board, please, give me back my subject and let me do my job.

Sincerely,

Wellington Grey

http://www.WellingtonGrey.net/

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