



# **National overview of the education system and the requirements/demands for natural sciences in the curriculum - UK**

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Leonardo da Vinci Programme Transfer of Innovation Project  
“Computer based Exercise Generation and Evaluation System  
for Mathematics, Physics and Chemistry Subjects – GENEXIS”

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NB: This overview must be read together with the relevant PowerPoint presentation that contains more up to date information. The presentation is available at <http://www.genexiseducation.com>

## GENERAL DESCRIPTION

**Who controls vocational educational institutions (what institutions provides funding for them, what institutions controls them):**

Vocational Institutions are Funded by the UK government through Regional 'Learning and Skills Councils' see <http://www.lsc.gov.uk>

**What are the main topics in the educational programme for vocational schools in mathematics, chemistry and physics and what are the major methods of teaching (theoretical or practical exercises, laboratory works):**

It is not possible to provide here a fully comprehensive list because different 'Exam Boards' set different curricula but this is a representative selection of secondary/core skills/post 16 subject matter. The methodology varies but involves a combination of theory and practical work.

For an overview please, visit : <http://www.standards.dfes.gov.uk/secondary/framework/>

### Specifics:

#### Physics

The following units are studied at AS: Atoms, Bonds and Groups; Chains, Energy and Resources. These cover the topics of atoms and reactions, bonding and structure, the periodic table, organic chemistry, rates of reaction and energy transfer, and aspects of environmental chemistry such as global warming and damage of the ozone layer and controlling air pollution.

At A2 Rings, Polymers and Analysis; Equilibria, Energetics and Elements are studied. These cover the topics of further organic chemistry and modern analytical techniques such as NMR and Infra Red Spectroscopy, polymers their production and issues with disposal, rate determining steps, acid and bases and pH atom economy and transition elements. These units are supported by a variety of class work and practical investigations.

#### Biology

**AS:** UNIT 1: Biology and Disease. Including work on the digestive and gas Exchange systems, communicable and non communicable diseases. UNIT 2: The Variety of Living Organisms. Including work on the genetic and environmental basis of variation as well as the biochemical and cellular basis of life. UNIT 3: Coursework – practical and investigative skills.

**A2:** UNIT 4: Populations and Environment. Including work on ecosystems, nutrient cycling, the human impact on the environment and speciation. UNIT 5: Control in Cells and in Organisms. Including work on the nervous and endocrine systems homeostasis and genetic expression. UNIT 6: Coursework – practical and investigative skills.

**AS:** UNIT 1: The Body and Its Diseases. Including digestion, disease and life style and how the body fights infectious disease. UNIT 2: Humans – Their Origins and Adaptations. Including DNA, cell division and cancer, human evolution and how we have changed our environment. UNIT 3: Coursework – practical and investigative skills.

**A2:** UNIT 4: Bodies and Cells In and Out of Control. Including IVF, growth and development, cell structure, hormones and nerves, homeostasis and diabetes. UNIT 5: The Air We Breathe, The Water We Drink, The Food We Eat. Including people and communities, human health, human impact on ecosystems, climate change and plants, people and their micro organisms. UNIT 6: Coursework – practical and investigative skills.

**Units Yr 1** Physics in Action: Communication, Designer Materials. Understanding Processes, Experimentation & Data Handling: Waves and Quantum Behaviour, Space, Time & Motion. Physics in Practice: 2 Coursework Tasks.

**Year 2** Rise and Fall of the Clockwork Universe: Models & Rules, Matter in Extremes. Field & Particle Pictures: Fields, Fundamental Particles.

**AS Six units:** Investigating Science at work; Energy Transfer Systems (Exam unit); Finding out about Substances; Food Science and Technology; Choosing and Using Materials (Exam unit); Synthesising Organic Compounds.

<b>A2 Six units:</b> Planning and Carrying Out a Scientific Investigation; Two from Medical Physics, Controlling Chemical Processes or The Healthy Body (The two chosen are both exam units); Three from Sport Science, Physics of Performance Effects, The Actions and Developments of Medicine, Colour Chemistry, The role of the Pathology Service, or Ecology Conservation and Recycling.
<b>Total number of lessons in each subject per whole period of education at vocational schools; the total number of lessons in each subject in relation to number of all lessons (all subjects together):</b>
A teacher at secondary teaches 22.5 hrs per week average. And a student will do 2- 3 hours of each core subject ( maths/English/IT per week)
<b>Amount of work for teachers – number of lessons per week, methodical work and extracurricular activities:</b>
<ul style="list-style-type: none"> <li>• 22.5 teaching hours</li> <li>• 13 weeks holiday</li> <li>• Sometimes up to 50 hours per week including out of school activities, reports and admin etc.</li> </ul>
<b>Teachers’ basic education required for work at schools, further education offered, improvement of professional skills:</b>
Government paid teachers (80%-90%) are required to complete Secondary school: 1st degree and 1 year (PGCE) teacher training
<b>How often exams, control works, laboratory works happen in the vocational schools?</b>
<ul style="list-style-type: none"> <li>• continuous assessment</li> <li>• annual exams</li> <li>• external exams at 16 yrs/17 yrs/18 yrs</li> </ul>
<b>How long does it take from teacher to prepare for the exam, control or laboratory work?</b>
Hard to specify but approximately 5 hrs per week average
<b>Could GenExis help in preparation with its exercise generation engine?</b>
Yes
<b>What systems of evaluation of knowledge are used in schools? (Ex. 1- 10, 1- 5, other)</b>
Still the written test/ often multiple choice is preferred

<b>ICT IN VOCATIONAL EDUCATION SCHOOLS</b>
<b>Significance of appropriate ministries in introduction and application of various technologies at vocational education schools:</b>
<ul style="list-style-type: none"> <li>• schools and colleges of further education work to a strategy defined by the department of Schools, Children and Families:</li> <li>• see: <a href="http://www.dcsf.gov.uk/index.htm">http://www.dcsf.gov.uk/index.htm</a></li> </ul>
<b>Which organization is responsible for application of technologies in vocational education schools:</b>
<ul style="list-style-type: none"> <li>• see <a href="http://www.dcsf.gov.uk/index.htm">http://www.dcsf.gov.uk/index.htm</a></li> <li>• see Government e-strategy 'Harnessing Technology' – 'applying technology to transform the way educational institutions operate and are managed...'</li> <li>• Learning and Skills Council</li> </ul>
<b>Are there any programmes or projects aimed at introduction and application of ICT, computer facilities and training of teachers and pupils?</b>
Numerous programmes e.g. <a href="http://www.bbc.co.uk/keyskills/it/1.shtml">http://www.bbc.co.uk/keyskills/it/1.shtml</a>
<b>SITUATION AT VOCATIONAL EDUCATION SCHOOLS</b>
<b>Are ICT used in learning process; in what ways:</b>
ICT is used throughout Education In Vocational Education Schools: nothing comparable to Genexis
<b>Number of computers in vocational education schools (x per 100 people):</b>
(secondary/vocational) 3.6 pupils per pc average (2006 figures)
<b>Are there separate computer rooms in each vocational education school, are they easily accessible?</b>
Yes and yes
<b>Is there a separate classrooms for subjects of mathematics, physics and chemistry:</b>
The subjects are almost exclusively taught by specialists at secondary/vocational level and the teacher will have their own rooms
<b>Material and technical equipment of the classrooms of physics, chemistry and mathematics (are there necessary technical and practical aids, is there a separate laboratory and assistant):</b>
Secondary and Vocational Institutions have dedicated support staff and equipment
<b>What type of teaching aids and materials are used in teaching of mathematics, physics and chemistry:</b>

Interactive white boards, software, etc
<b>Is there any information about further education or work carrier of graduates (how do they use the gained knowledge):</b>
Maths, Science and Physics are taught by graduates in their field
<b>THE OPINIONS</b>
<b>The general opinion of teachers – where do they get the materials for work, do they use any personal materials, how often they use ICT and is it convenient for them, what is the general situation in preparation and application of exercises:</b>
Teachers work from core texts but use their own initiative to identify software materials; they either buy the software themselves or, if it is expensive, they request their employing institution to purchase for their use in training
<b>The general opinion of employers – what do they expect and what is the real knowledge of graduates of vocational education schools; is the knowledge sufficient and are they capable to use them in practice:</b>
In 2009 and with the introduction of the New Diploma the role and influence of the Employers will increase significantly in vocational education. This reflects the fact that a) the UK is recognised as having a significantly lower skills levels and productivity than its major industrial rivals b) Employers are traditionally dissatisfied with the service provided them by State Institutions/Services
<b>The general opinion of pupils – how often ICT are used in teaching process, is it successful, does it ease the digestion of the particular themes; do they get all needed information and are the materials understandable:</b>
The view of pupils is that IT is essential for the efficient and effective delivery of all areas of Education and to the acquisition of Knowledge
<b>Please define the general opinion of teachers, employers, pupils - in what area of teaching process use of ICT give more effectiveness:</b>
According to research ICT/e-learning is used by subject areas as follows: ICT: 56% of Vocational Institutions Science and Maths: 29% Engineering : 18%