



ECRR Educational Outreach Seminar

Dr Jack Jackson
HMIe
7 June 2006

1926 - Higher Zoology paper



'Describe the structural features of two common Protozoa eg Amoeba and Paramoecium. Mention some important ways in which they differ from animals such as Hydra or an earthworm.'

'Make a drawing of a bird's breast bone and pectoral girdle. Comment briefly, but adequately, upon their distinctive features.'



Higher Zoology Syllabus - 1958



'Structural and functional study (including dissection and/or microscopic examination together with the adaptations to environment of the following:

Amoeba, Paramecium, Hydra, earthworm, cockroach, dogfish (or skate), frog.'



1950s



- Group Certificate in Lower or Higher Science [Botany, Chemistry, Physics, Zoology]
- Uptake of Highers (1958)
 - Chemistry 3099
 - Physics 2864
 - Botany 540
 - Zoology 339



Lower Zoology - 1956



'Make a list of six wild animals which you might encounter during a walk along a country road on a summer evening. Choose two, differing as widely as possible, and write an account of their habits and special adaptations to suit their mode of life.'



National Development Programmes

Ordinary Grade and Highers (1960s)

Standard Grade (1983)

Revised Higher (1987)

5-14 (1990)

Higher Still (1994)

3-18 Curriculum Review (2004)



Presentation in the sciences (2005)



	Biology	Chemistry	Physics	Science	Rank (Biology)
SG	22213	20876	16917	6202	4 th [E, M, Fr]
Access 3	1268	1395	789	-	3 rd [M, C]
Int 1	3295	1602	1555	-	3 rd [E, M]
	Biology	Hum Biol	Chemistry	Physics	Rank (B+HB)
Int 2	5336	-	2728	2354	3 rd [E, M]
Higher	8943	3609	9411	8952	3 rd [E, M]
AH	1693	-	1792	1426	3 rd [M, C]

Teachers of Science in Scotland



Background

- most primary teachers are trained as generalists to deliver the full range of the curriculum
- all secondary science teaching is carried out by specialist teachers



Teachers of Science in Scotland



Strengths

- majority of secondary science teachers hold an honours degree (75% in C, 67% in B&P)
- most science teachers are very experienced (60% over 45; 6% under 30)
- supply of science teachers across the disciplines has met the demand for the last 15 years



Teachers of Science in Scotland



Weaknesses

- many primary teachers have no qualification in science; often dropped science at S2
- many primary teachers lack confidence in their ability to teach science
- many science teachers, now in their 40's and 50's, are required to teach knowledge and skills not covered in their university training



Continuing Professional Development⁺ - desirable or essential?



A teacher,
born in 1941,
trained in 1964,
will retire in 2006.

A teacher,
born in 1983,
trained in 2006,
will retire in 2048.
If they're lucky!



CPD in biology

Continuing.....
Professional.....
Development....

Subject knowledge and skills
Pedagogical knowledge and skills
Leadership/management
Careers education





Review of Science 3-18

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3-18 Curriculum Review



To prepare
21st century citizens

To produce
sufficient
science specialists

To describe
a progressive
curriculum

**A
golden
opportunity!**

To remove
professional barriers

To address
content and
assessment overload

To provide CPD

To give
teachers ownership



Science Strategy for Scotland



Ensure all learners acquire the capacity to cope as citizens and decision makers when dealing with scientific issues

Secure very high levels of achievement by those specialising in science



Principles of the Curriculum 3-18



Design principles

- Challenge and enjoyment*
- Breadth
- Progression
- Depth*
- Personalisation and choice*
- Coherence
- Relevance*



Purposes of the curriculum from 3-18



To enable all young people to become:

Successful learners

Confident individuals

Responsible citizens

Effective contributors



successful learners

with

- enthusiasm and motivation for learning
- determination to reach high standards of achievement
- openness to new thinking and ideas

and able to

- use literacy, communication and numeracy skills
- use technology for learning
- think creatively and independently
- learn independently and as part of a group
- make reasoned evaluations
- link and apply different kinds of learning in new situations

confident individuals

with

- self respect
- a sense of physical, mental and emotional wellbeing
- secure values and beliefs
- ambition

and able to

- relate to others and manage themselves
- pursue a healthy and active lifestyle
- be self aware
- develop and communicate their own beliefs and view of the world
- live as independently as they can
- assess risk and take informed decisions
- achieve success in different areas of activity

**To enable all young
people to become**

responsible citizens

with

- respect for others
- commitment to participate responsibly in political, economic, social and cultural life

and able to

- develop knowledge and understanding of the world and Scotland's place in it
- understand different beliefs and cultures
- make informed choices and decisions
- evaluate environmental, scientific and technological issues
- develop informed, ethical views of complex issues

effective contributors

with

- an enterprising attitude
- resilience
- self-reliance

and able to

- communicate in different ways and in different settings
- work in partnership and in teams
- take the initiative and lead
- apply critical thinking in new contexts
- create and develop
- solve problems

Areas of concern in science

Under-achievement at P5-P7 and at S1/S2

Imbalance in formative and summative assessment

Lack of appropriate differentiation

Poor preparation for citizenship

Too little attention to contemporary aspects of science and to social, moral and ethical issues

Content out-of-date



Areas of concern in science

Weak relationship with technology

Lack of parity of provision for pupils following the 'science line'

Too few pupils taking two sciences

Apparent fall off in uptake of sciences at Higher

Overlapping provision of levels



Group remit



- Base work on existing documents
- Write outcomes at 5 levels (3-15)
- Test against set of evaluative questions
- Use research on effective T&L of science



What's the same?



- The organisers for learning
 - Our living world
 - Our material world
 - Our physical world
- Much of the content



What's different?



- Fewer outcomes - less specific
- I 'can' statements
- Content updated where necessary
- A new skills set
- Outcomes integrate K&U, skills and citizenship



Styles of outcomes



- Outcomes that describe the development of big ideas - K&U
- Citizenship outcomes - inviting pupils to express informed views
- Updating outcomes - allowing teachers to update with contemporary examples



Example - K&U - living world



- I can make observations in my local environment and represent these in a variety of ways
- I can construct food chains from observations in my local environment
- I can construct a food web and predict the consequences of change
- I can explain the importance of biodiversity to humans



Example - K&U - physical world



- I can talk about how to stop and start objects moving
- I can investigate how far objects travel over different surfaces
- I can describe how to measure the speed of an object
- I can explain the safety features of cars



Example - citizenship



- I can research, debate and present information on a local environmental issue
- I can research, discuss and present information on the recycling of plastics in my own community



Example - updating



- I can describe the features of modern biotechnology
- I can describe the features of a modern communications system
- I can research and present information on sustainable polymers



Implications for L&T

- Experiential learning
- Discussion and debate
- Deeper understanding
- Cross-curricular work
- Assessing a wider range of evidence
- ICT
- Thinking skills
- Social, moral and ethical issues
- Benefits and risks



2006 and beyond - The curriculum

How do we ensure that pupils understand the importance of evidence over assertion?

How do we ensure that pupils appreciate the benefits and risks associated with scientific developments?

How do we ensure that more pupils leave school with a better understanding of contemporary issues in science?

How do we avoid giving the impression that all famous scientists are dead?



The challenge for HE

How will HE respond to the challenges presented by A Curriculum for Excellence?

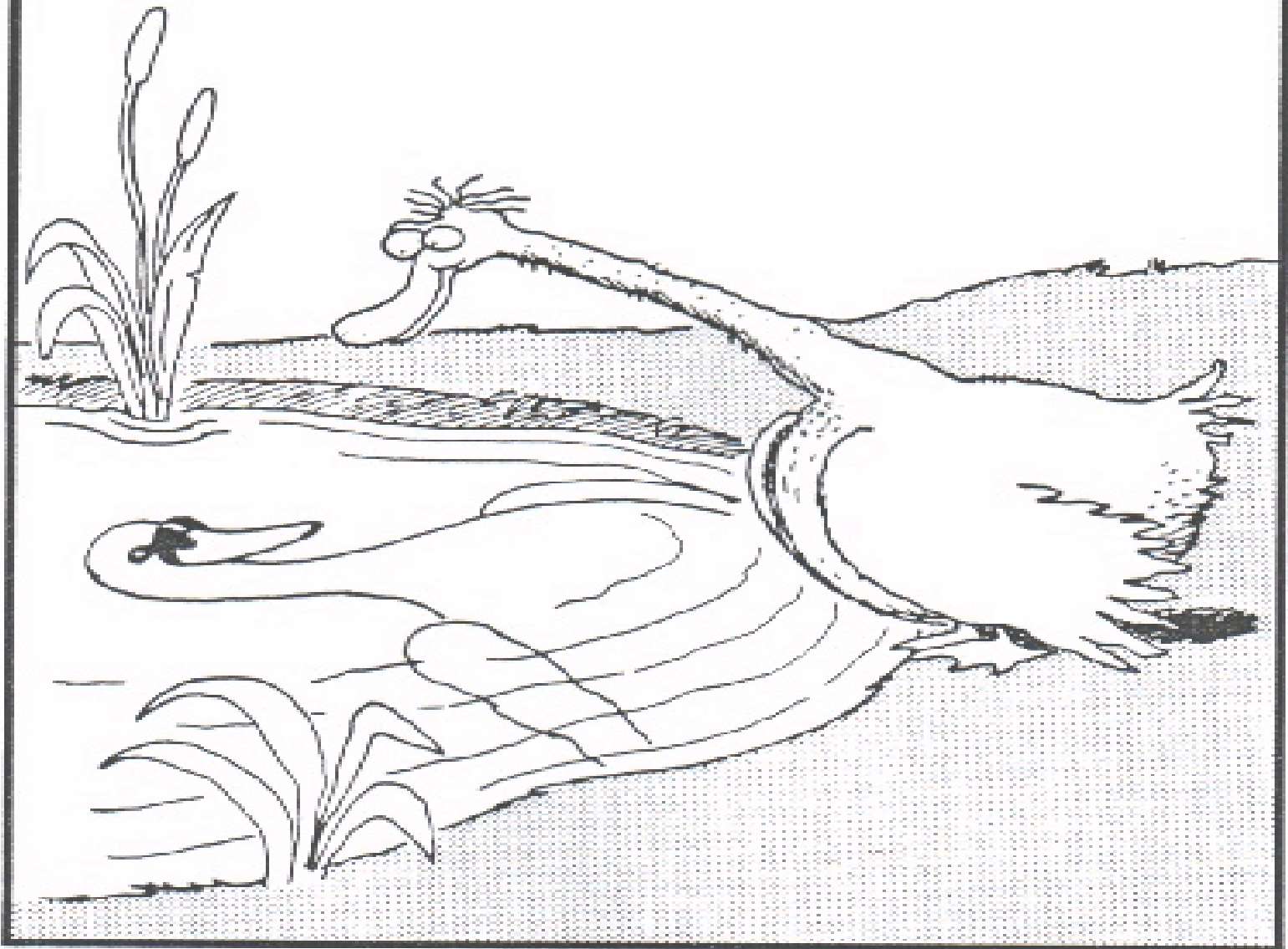


Will they adopt the 4 national capacities and associated principles?

Will they update courses and assessment to reflect what is known about effective teaching and learning?



Larson





Review of Science 3-18

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