Astronomy and the School Curriculum in South Africa

Anthony Lelliott

Marang Centre for Maths and Science Education, School of Education, University of the Witwatersrand, Johannesburg

tony.lelliott@wits.ac.za

Twitter: @drtoeknee

Two questions for you …

- What astronomy content is in the current primary and secondary school curricula?
- What astronomy content should be there?

Overview ....

- SA is trying to promote astronomy as a “hook” into science.
- Astronomy topics are covered well at primary and junior secondary level.
- Astronomy is almost absent from the senior high school curriculum.

Overview ....

- Some SA universities only cover astronomy at post graduate level.
- There is therefore a GAP in astronomy coverage in the schooling system and at UG university level.
- What should we do about the gap at senior high school level?

Some acronyms

Acronym	Explanation/Comment
GET	***General Education & Training (grades 1-9, old Std R-7)***
FET	***Further Education & Training (grades 10-12, old Std 8-10)***
NCS	***National Curriculum Statement***
RNCS	***Revised National Curriculum Statement***
C2005	***"Curriculum 2005"***
CAPS	***Curriculum and Assessment Policy Statement***
NS	***Natural Science (GET)***
SS	***Social Science (Geography & History GET)***

SA school curricula: complex!

- Racialised curricula prior to 1990.
- Std 1-10 changed to grades 1-12.
- Post 1990, "white" curricula revised to form "Interim Core Syllabi" (ICS).
- ISC in place for senior secondary (Gr 10-12) until c 2007.
- 2007-2011: Gr 10-12 used NCS.

Curricula continued

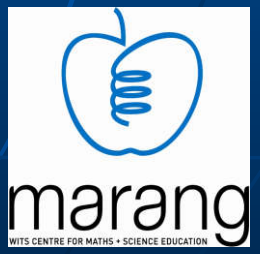
- Late 1990s to 2011, lower grades used "Curriculum 2005" and the RNCS.
- Current (2012) curricula are CAPS: the Curriculum and Assessment Policy Statement. This 'updates' previous curricula.

Astronomy in old curricula (Std 5-7)

Old ICS General Science	Old ICS Geography
Light	***??***
Radiation	

Astronomy in old curricula (Std 8-10)

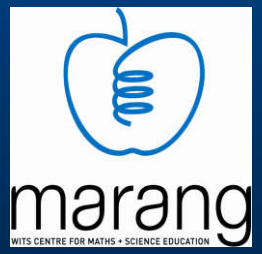
Old ICS Physical Science	Old ICS Geography
Electromagnetic spectrum	***??***
Gravitation	
Radiation	
Nuclear fusion (& fission)	



Current Natural Science Curriculum (CAPS)

Grade	Hours	Topic
*4**	*23/112 (20%)*	*Space exploration. Moving on land (Technology). Objects in the sky: sun, moon, earth,*
*5**	*0/112 (0%)*	*Structure of Earth (also surface, sedimentary rocks, fossils)*
*6**	*8¾/112 (8%)*	*Solar system: sun, Earth, moon. (also ecosystems)*

* at Gr 4-6 subject is 'Science & Technology'



Current NS Curriculum (CAPS)

Grade	Hours	Topic
7	*7/88½ (8%)*	*Sun and the solar system* *Solar system* *Planet Earth* *Also biosphere etc.*
8	*18/90 (20%)*	*Earth in space* *Solar system* *Eclipses* *Earth's atmosphere*

Current NS Curriculum (CAPS)

Grade	Hours	Topic
8	*12/90 (13%)*	***Beyond the solar system.*** ***Light energy*** • *radiation* • *reflection* • *absorption* • *refraction and dispersion*
9	*2/90 (2%)*	***Energy & Change strand: Gravity, Force, Weight, Mass.*** *[Metal extraction & Renewable and non renewable resources]*

Current SS Curriculum (CAPS)

Grade	Hours	Topic
8	*6/120 (5%)*	***The Globe*** ***Hemispheres (review from Grade 6)*** ***The Earth's rotation on its axis – day and night (review)*** ***World time, time zones, South African Standard Time*** ***The Earth's revolution around the sun:*** ***Angle of axis*** ***Equinox, solstice and the change in angle of the midday sun*** ***Seasonal changes in lengths of day and night*** ***Seasonal temperature changes***

Astronomy in current CAPS (Gr 10-12)

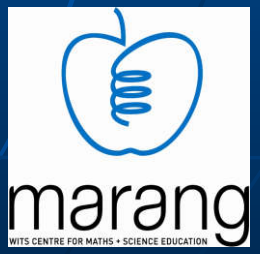
Physical Science [20 hours]	Geography [4 hours]
Electromagnetic radiation: dual particle/wave, energy. [6 hours]	***The Earth's Energy Balance***
Newton's Universal Law of Gravitation [4 hours]	***- The unequal heating of the atmosphere – latitudinal and seasonal;***
Magnetism & Earth's magnetic field [4 hours]	***- Significance of Earth's axis and revolution around the Sun;***
Doppler Effect: sound & light red shift [6 hours]	***- Transfer of energy and energy balance – role of ocean currents and winds.***
"Project work" (posters): solar energy, aurora borealis, nuclear structure, radioactivity – formally assessed.	

So where does this leave us?

- At Primary and Junior High School:
  - Astronomy accounts for 11% of grade 4-9 NS curriculum (albeit unequally distributed) + 5% (Grade 8) of SS curriculum.
  - "Quite well-catered for"?

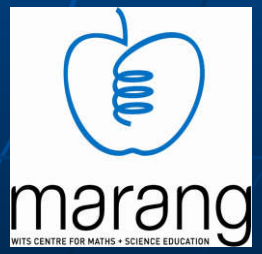
So where does this leave us? (2)

- At Senior High School (Gr 10-12):
  - Astronomy accounts for 4% of Physical Science Gr 10-12 + 1% (Grade 11) of Geography curriculum.
  - "Minimal"?



So where does this leave us? (3)

- Some SA universities (eg UCT, UWC, UFS) run undergraduate astronomy courses for a 'general' audience (i.e. not necessarily physics students).
- Many do not (eg Wits).
- Such courses can encourage an interest in astronomy beyond physics/pure science students. This is important for SA: eg Astronomy Geographic Act, general interest in science, etc.



What content is taught?

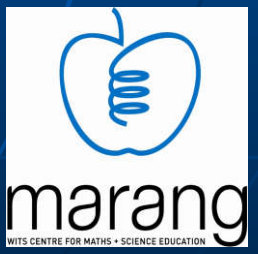
- Lower grades:
  - Earth, Solar System, Light, Space Exploration.
- Upper grades:
  - EM radiation
  - Earth's magnetic field
  - Red shift
  - Universal Law of Gravitation

What content should be taught?

- Views of US astronomers re. what constitutes a basic 'college' astronomy course.

What content should be taught?

- Jay Pasachoff: mix of basic (eg Moon phases, seasons) and current research (eg pulsars, black holes)
- Phil Sadler: the basics should be mastered. Doing is more important than hearing about new discoveries. We need to heed the lessons of "A Private Universe"

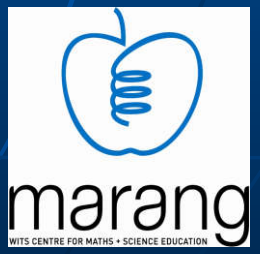


What can be done?

- Lobby DST and DoE
- Not try to squeeze more content into FET curriculum. Instead, try to stress an "astronomy focus" to existing FET topics.

What can be done?

- Offer FET physical science teachers supplementary pre-packaged astronomy content.
- Encourage universities to run introductory astronomy courses available to Science and Arts students (like UCT, UWC & UFS do!)



Your comments and ideas are welcome.
Thank You

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