How *No Child Left Behind* Pluto'd High School Astronomy and Why It Just Won't Go Away

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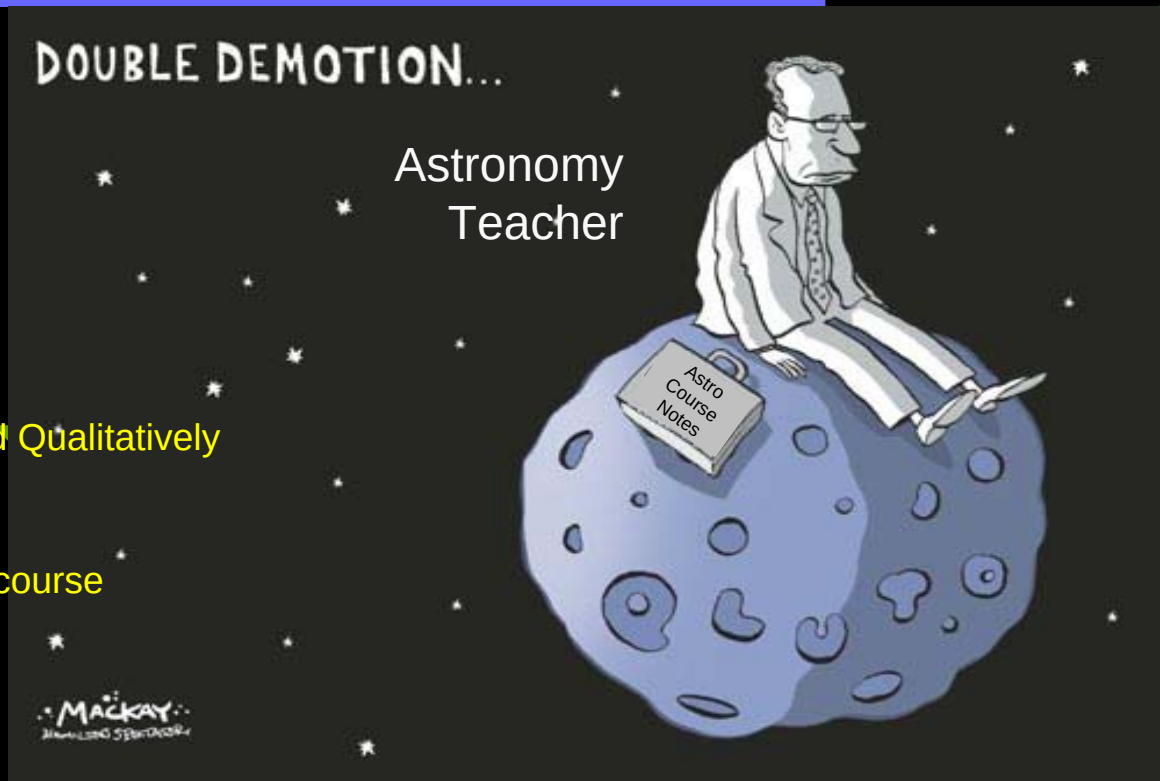
The History and The Survey

Effects? What Effects?
Teachers, Courses and Students
Direct and Indirect, Quantitatively and Qualitatively

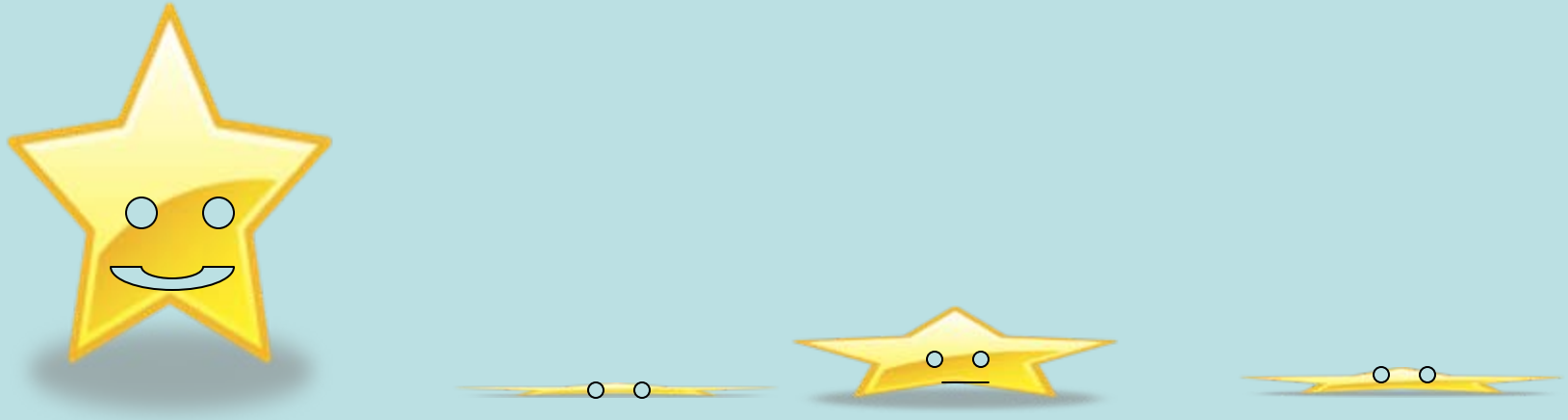
Why it does not go away

What can be done for the future of the course



Astronomy was demoted long before Pluto…

- Academies and High Schools
- Committee of Ten
- Depression Years
- Space Race Years



1800's

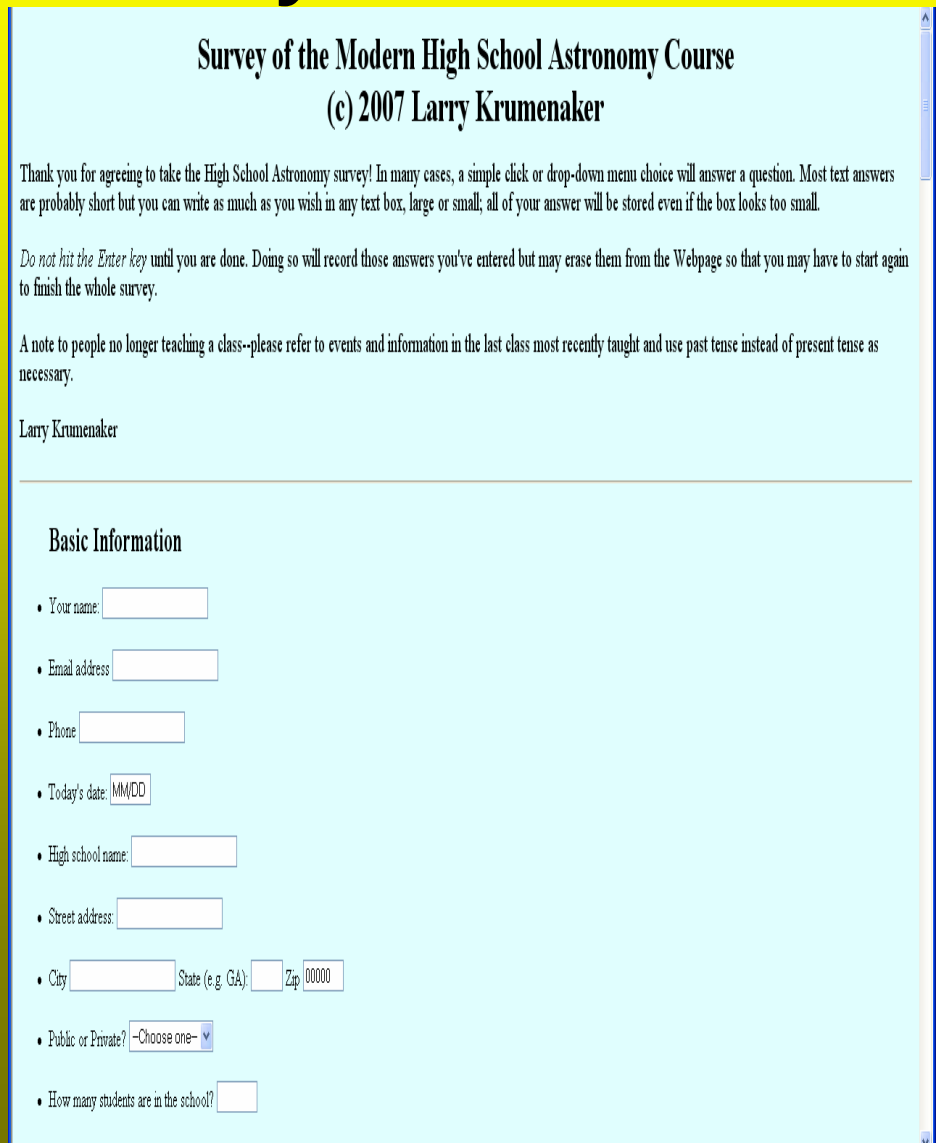
early 1900's

Space Age Starts

End of 20th Century

2007 High School Astronomy Course Survey

- Multimethod project in Spring 2007 with Web-forms and Word files and some interviews
- Postal Survey version Fall 2007, to principals Spring 2008
- First survey since Sadler's 1986 study.
- Over 400 usable responses
- High School Planetariums – Results of a Survey, *The Planetarian*, Dec. 2008.
- *Astronomy Education Review*, Available as Preprint, ~July 1, 2009



Survey of the Modern High School Astronomy Course

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Thank you for agreeing to take the High School Astronomy survey! In many cases, a simple click or drop-down menu choice will answer a question. Most text answers are probably short but you can write as much as you wish in any text box, large or small; all of your answer will be stored even if the box looks too small.

Do not hit the Enter key until you are done. Doing so will record those answers you've entered but may erase them from the Webpage so that you may have to start again to finish the whole survey.

A note to people no longer teaching a class--please refer to events and information in the last class most recently taught and use past tense instead of present tense as necessary.

Larry Krumenaker

Basic Information

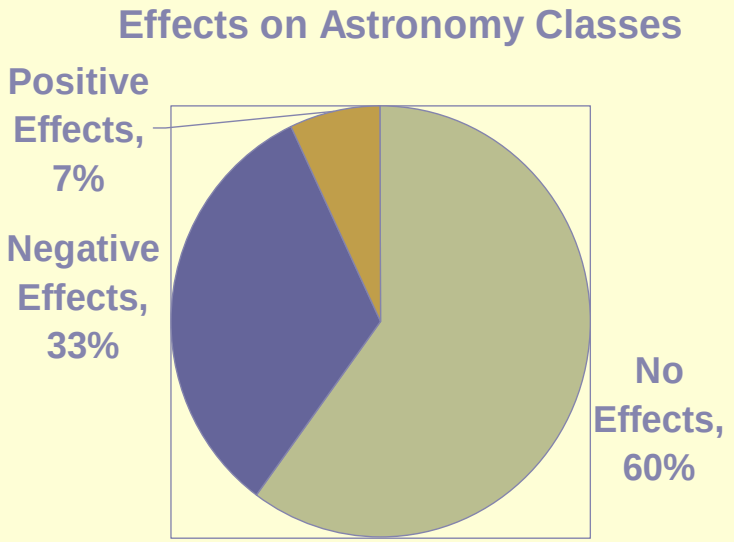
- Your name:
- Email address
- Phone
- Today's date: MM/DD
- High school name:
- Street address:
- City State (e.g. GA): Zip 00000
- Public or Private? –Choose one–
- How many students are in the school?

The Big Question…

What, if any, positive or negative effects have you felt *in the astronomy course* from the No Child Left Behind Act? (And why do you feel this way?)

…Has NCLB Left Astronomy Behind?

60% of teachers report no direct effects.



No Child's reported **negative** (33%) effects are mostly *indirect* because of what happens elsewhere in the school, not directly to course. But…

Two direct effects have been noted among the reported negative effects:

Primary Direct effect: Difficulties in being considered 'highly qualified;' there is no national test or certification in astronomy.

The other one…

2. Purpose of the course has changed.

Historical Purposes for an Astronomy Course, In Chronological Order

Course Purpose Description	Survey Code
All educated persons should know this	educated
Develop minds, thinking skills, imagination	mental improvement
Teach skills students can use in life	skills
Master this content, like for any other course	mastery
Integrate many facts, processes, and sciences together	multi/interdisciplinary
Increase awareness/literacy of how science works	science literacy
Increased appreciation for Earth, sky and our place in the Universe	appreciation
Empower the student, to show the world is predictable and learnable	empowerment

	education	mental improvement	skills	mastery	multidis-ciplinary	literacy	appreciation	empowerment
Post-NCLB	9.6	16.4	1.4	2.7	17.8	13.7	27.4	11.0
Post- NSES	3.7	19.8	1.2	3.7	14.8	6.2	44.4	6.2
Post- Benchmarks	8.0	4.0	0.0	0.0	16.0	8.0	52.0	12.0
Pre- Benchmarks	6.3	21.9	0.0	3.1	12.5	15.6	37.5	3.1
Total	6.6	17.1	0.9	2.8	15.6	10.4	38.4	8.1

Highest values **Second highest** **Third highest**

Appreciation **Mental Improvement** **Multidisciplinary nature**

The only statistically significant border is at Post-NCLB/Post-NSES ($p < .01$)

3. Indirect Negative Effects

Dropping enrollments and course cancellations

Bio, Chem, Physics testing and standards

fewer elective opportunities for students

→Teachers reassigned, too.

Loss of funds and loss of status

Not in state standards or testing? Not in Budget

Fewer outside resources available (number of planetarium trips down, guest speakers)

Fewer chances for collaborations with fellow teachers

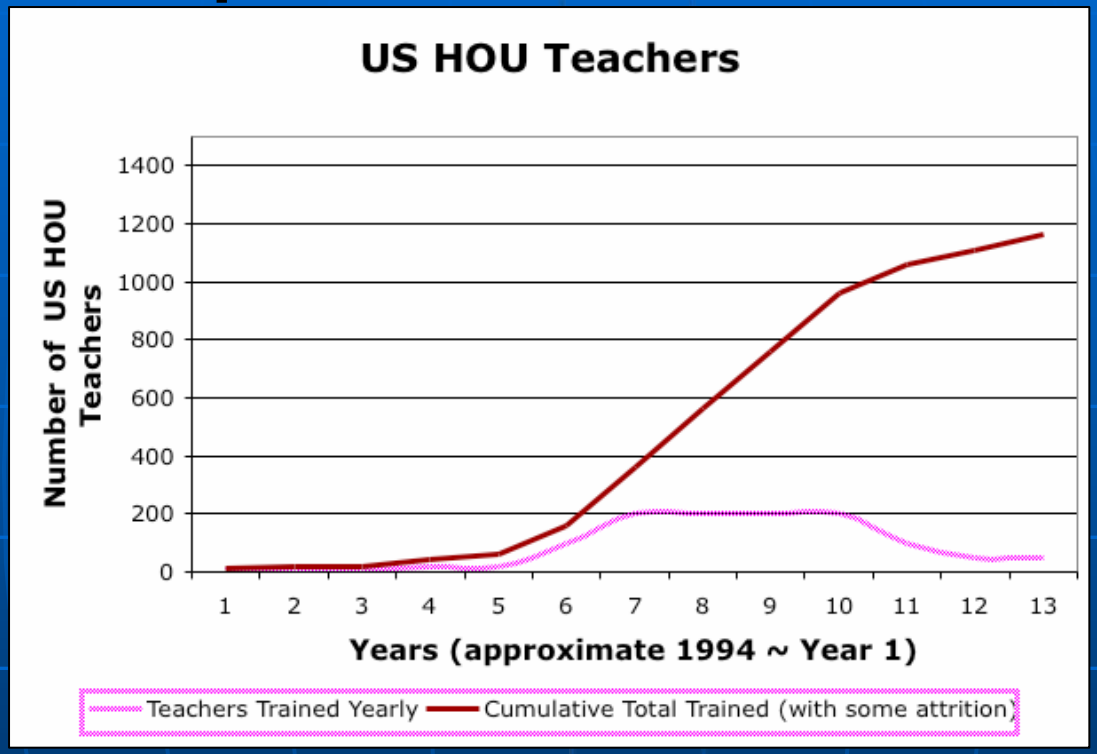
4. Enrollments

- Class Size
  1986 22
  2007 22.7 (public) 22 (overall) 17 (private)

- Number of students taking astronomy
  1986 5% (but NCES says ~1%)
  2007 3.5% (latest NCES value is 3.3%)

- Trend 39% declining, 38.5% steady, 22% growing

5. Example of A National Effect



The number of teachers taking the HOU workshops, 1994 – 2007, from Pennypacker (2008), used with permission.

Positive effects (7%):

More literacy and math additions to course

Enrollment *increases* because of perception that astronomy is easier

Why Astronomy Won't Go Away

- Capstone==usually beyond the direct range of NCLB.
- In some states, a lack of standards means a lack of oversight!
- Astronomy has student interest.
- Astronomy is a useful catch-all alternative for low achievers as well as a good second/advanced course for college-bound students.

High School Astronomy's Future Depends On…

1) Having an enthusiastic and interested teacher

2) Whether science becomes a major factor in determining AYP status

3) How well other courses do in the school in regards to AYP

If #2 happens, many elective science courses may likely be eliminated for remediation in traditional sciences. But, conversely…

3) …many states are planning to make 3 or 4 years of science a requirement which may *increase* the number and need for astronomy classes and teachers. If so…

4) … there is a dire need for training in astronomy and astronomy pedagogy, for some kind of astronomy certification and/or masters programs in astronomy education as well as more workshops actually reaching high school teachers.

What do you do if your

Astronomy Course

is Pluto’d in your own school?

If you should have to defend or justify the course at some future date, what arguments would you use? Why?

- cross-curricular and interdisciplinary.
- flexible, can work with any level of student ability and grade level.
- the science with the highest interest factor while other courses are losing students.
- part of world cultures.
- a help to AYP status because of use of math and language so it is *not irrelevant* to AYP efforts.
- a good institutional benefit providing good PR and money for students from other schools, and better competition with other public and private schools.
- is accessible, broadening and students can contribute to it.

How Can Astronomy Be Un-Plutoed?

Survey asked….What would have to be done to increase the number of astronomy courses in the United States?

Both teachers and principals are united in the same answers.

Increasing the Number of Courses

- Elevate the status of astronomy.
  - National, state, and local officials must see astronomy as valuable as bio, chem or physics. More than a filler, it can lead students to a career in science.
- Incorporate more astronomy into standards and testing.
- Require more years of science.
- Make universities see it as a lab science.
- More qualified teachers!
  - Increase opportunities for professional development
  - Provide some form of astronomy certification
- Have more influence from NASA and business world.

Questions?

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For Future Reference:

High School Planetariums – Results of a Survey, *The Planetarian*, Dec. 2008.

The Modern U.S. High School Astronomy Course, Its Status and Makeup and the Effects of No Child Left Behind*. Astronomy Education Review*, as Preprint, ~July 1, 2009.

SEPA Banquet Talk: Russian and American High School Astronomies…, *The Planetarian*, Submitted

Book*: To Teach The Stars, 2010?*

Thank You for Listening