

Next Time I'll Bring My Crayons

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Engaging students in dry technical subjects

eg: Mathematics, Statistics, Chemistry ...

My Experience Teaching Phil111: Introduction to Logic

Gratuitous Logic Example

To Prove $(\forall x)(Fx \supset Gx), (\exists x)\neg Gx \vdash (\exists x)\neg Fx$:

1	$(\forall x)(Fx \supset Gx)$	Premise
2	$(\exists x)\neg Gx$	Premise
3	$\neg Gx$	Assumption
4	$Fa \supset Ga$	1 $\forall E$
5	$\neg Fa$	3,4 Modus Tollens
6	$(\exists x)\neg Fx$	5 $\exists I$
7	$(\exists x)\neg Fx$	2,3,6 $\exists E$ <i>QED.</i>

Outline

What are Technical Subjects?

Challenges

Strategies

Assessment

Technical Subject Challenges

- learning a technique requires practice
 - problem sets
 - lots of problem sets
 - requires discipline
- not always easily grasped at first
- excitement varies with taste
- there are 'right answers'

Particular Problems for Introductory Classes

- wide range of ability for the subject
- wide range of interest in the subject
- course covers 'the basics' — the 'bread and butter'. The material that must be covered to approach the big issues of the subject.

More Problems

- how can a course be structured to challenge and interest the good students, while making it comprehensible and tractable for the struggling students?
- Tutors must work within the lecturer's structure, but still face the same essential problem whilst being limited in what they can do to address it.
- Material covered in tutor workshops and conferences often more appropriate for more discursive courses.

Strategies

- Socratic method (with an individual or very small groups)
- talk beyond the syllabus
- Classroom exercises
 - keeps them occupied — so you can see them individually
 - different from the textbook exercises
 - can perhaps afford some creativity

Posters: Ideas

- work in groups
- have them write their own questions
- pass posters around at each stage — allows for a bit of friendly rivalry

Posters: Example

- create a world — some individuals and some properties
- make statements about it in formal logic
- give truth values (say whether they're true or false)
- translations to and from English

F - fish
l - flower
B - big
S - Small
M - medium
P - person

	A	B	C	D	E
F	1	1	1	1	1
l	0	1	0	1	0
B	0	0	1	0	0
S	1	0	0	0	1
M	0	0	0	1	0
P	0	0	0	0	1

A $(\forall x)(Bx \supset Fx)$
 E $(\forall x)(Fx \supset \sim Fx)$
 I $(\exists x)(Fx \ \& \ Mx)$
 O $(\exists x)(Sx \ \& \ \sim Lx)$

$(\forall x)(Px \supset Fx)$
 $(\exists x)(Fx \ \& \ l x \ \& \ Mx)$
 $(\forall x)(Px \supset x) = (\exists x)(Fx \ \& \ Sx)$

x has an evil twin, y
 y keeps x in a basement
 x has been kept in a basement by y
 x is capable of wearing shoes

	B	a	b	c	d
a	0	0	0	0	0
b	0	0	0	0	0
c	1	1	0	1	1
d	0	1	1	0	0

Everyone who is capable of wearing shoes has been kept in a basement
 Everyone has an evil twin

$(\forall x)(\sim Sx \supset (\exists y)xTy)$
 $(\forall x)((\exists y)xTy \supset (\exists z)xBz)$
 $(\forall x)(\exists z)xTy$
 $\forall x \exists z xTy$

Everyone is original evil twin

Did it work?

- students generally seemed to enjoy tutorials
- teaching assessment overall positive

although:—

- large drop-off
- attendees not necessarily the ones in most need of help
- may have been a bit *too* fun. . .

Problems

- are they all contributing to the group exercises?
- how to encourage people who need help to seek it?

Next Time:

- More structure — e.g. present beyond syllabus material or interesting points as planned, regular items
- Return to more traditional problem sets — some individual work
- Bring crayons. . .