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Addressing the looming crisis in the supply of suitably qualified teachers

Kerri-Lee Harris
University of Melbourne

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Addressing the looming crisis in suitably
qualified science teachers in Australian
secondary schools
Kerri-Lee Harris

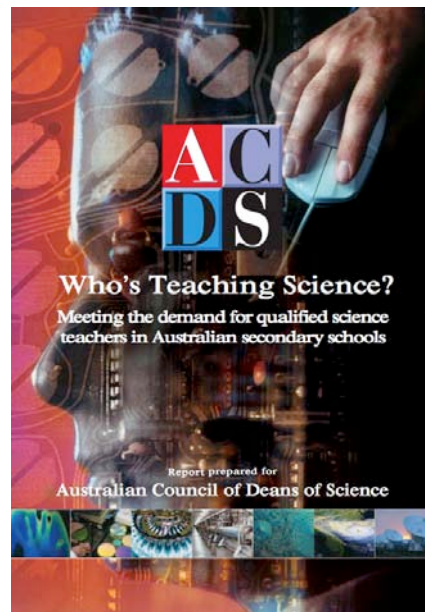
The University of Melbourne >

Centre for the Study of Higher Education



- concern over the declining proportion of students studying physics, chemistry and advanced mathematics

- identified need for more information on the working lives of science teachers



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- Brief description of the approach taken in the *Who's Teaching Science?* study
- Principal findings from *WTS*:
 - Current and looming shortage of science teachers
 - Disciplinary background of current teachers
 - *discussion*
- Issues for universities
 - *discussion*



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Aims of the study

- Current and future demand:
 - ability of schools to recruit science teachers
 - age and career plans of current teachers
- Science background of teachers:
 - Investigate the match between current teaching and previous discipline-specific science studies
- Influences upon teachers:
 - views from within the teaching profession
- Attracting people to a career in science:
 - ideas from teachers and heads of science



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Methodology

- Survey of 629 secondary schools, including:
 - all states/territories
 - Catholic, government and independent schools
 - all geographic areas (ARIA index)
- Questionnaires:
 - Teachers of science
 - Heads of science departments in schools



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Survey of teachers

- Current teaching
 - science subjects (inc year level)
- Tertiary studies
 - highest qualification; science subjects studied
- Demographics and career plans
 - age; sex; years experience & 5yr career plans
- Attraction to teaching profession
 - themselves; others
- Dissatisfying aspects



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Teachers responding to WTS study

	Cath	Gov	Ind	Total
ACT	32	*	9	41
NSW	47	69	24	140
NT	3	27	13	43
QLD	26	126	32	184
SA	34	144	55	233
TAS	35	85	19	139
VIC	88	144	68	300
WA	44	53	30	127
Total	309	648	250	1207



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Survey of heads of science in schools

- Current teaching at the school
 - science subjects offered (inc year level); number of people teaching
- Necessary tertiary qualifications to teach science
 - minimum discipline-specific level necessary; satisfaction with qualifications of schools' science staff; Science and Education Faculty roles in teacher preparation
- Recruitment and retention
 - Difficulties with attracting new teachers; difficulties retaining teachers
- Attracting new teachers to teaching profession



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Heads responding to WTS study

	Cath	Gov	Ind	Total
ACT	5	*	2	7
NSW	8	16	6	30
NT	1	13	4	18
QLD	9	30	9	48
SA	5	32	13	50
TAS	3	21	6	30
VIC	10	21	10	41
WA	10	21	11	42
Total	51	154	61	266



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There is a current and growing shortage of science teachers

- Schools report difficulties recruiting teachers with physical sciences background



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% of senior schools reporting recruitment difficulties

	Biology	Chemistry	Physics
all	2.7	30.6	41.1
Cath		54.3	67.4
Gov		27.3	35.5
Ind		21.2	30.8



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We have been trying to employ a second physics teacher for about five years with no success.

[NSW; ARIA = 'accessible']

School had few applicants for a senior chemistry position advertised two years ago

[VIC; ARIA = 'highly accessible']

When teachers are 'on leave' there are few (if any) replacements in the areas of physics and chemistry (there are plenty of biologists!)



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No shortage of teachers with strong biology background

Our teachers have predominantly Biology backgrounds – little pure Maths or Physics training

I have far more Biology teachers than classes

Physical sciences positions are always more difficult to fill than Biological
[WA; ARIA = 'highly accessible']



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Many schools predict increasing difficulties in the near future

It is getting harder & harder to get good quality Science teachers under the age of 30. In Physics & Chemistry the “pool” of good quality teachers is most certainly dwindling

Stable staff has prevented this problem (*recruitment*) in some subject areas. When a vacancy has arisen, it has been a problem. We have been lucky. I can foresee future problems, and am aware of problems in other local schools



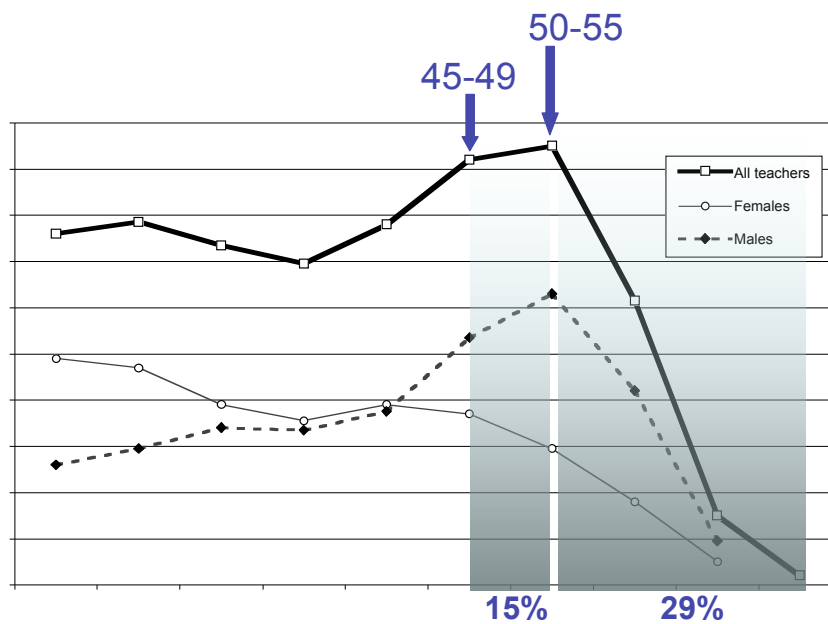
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There is a current and growing shortage of science teachers

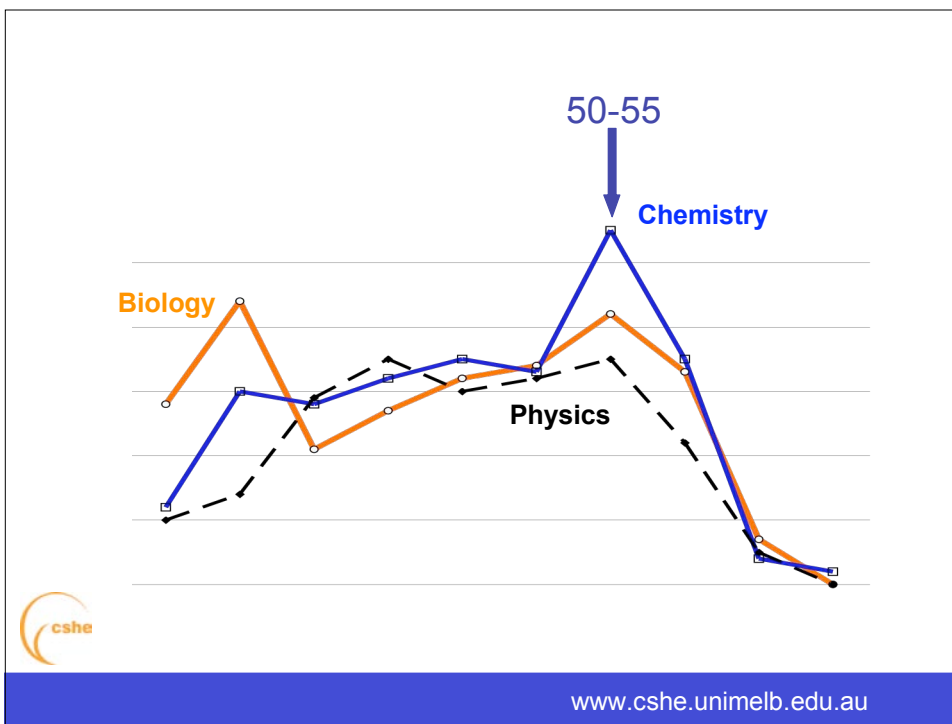
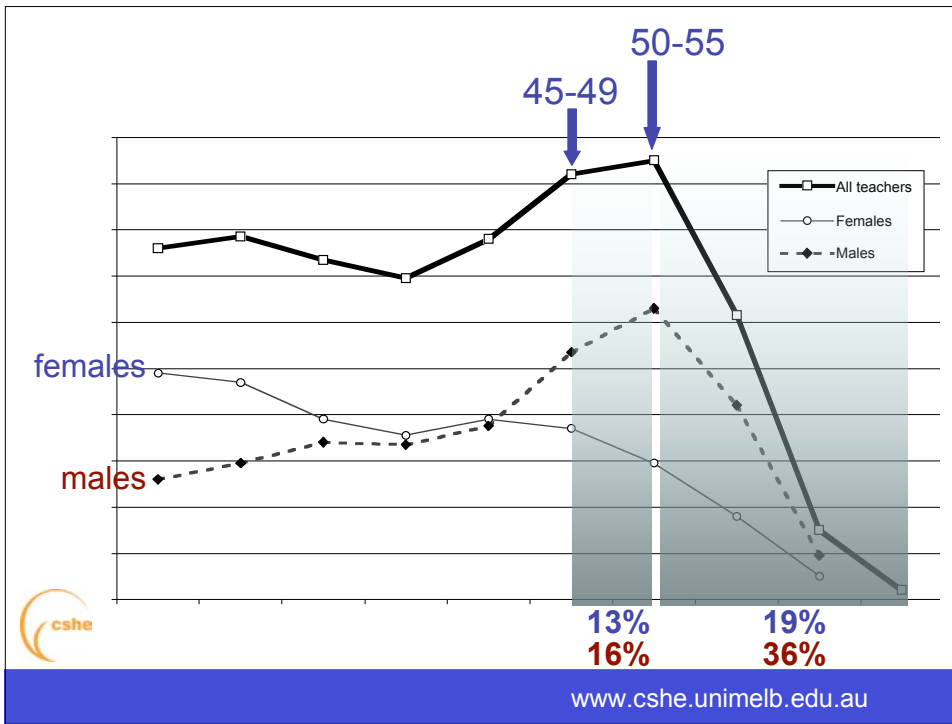
- Schools report difficulties recruiting teachers with physical sciences background
- An aging teaching workforce



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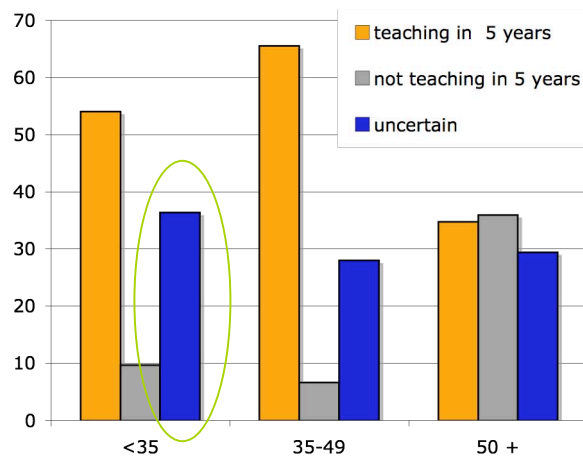
There is a current and growing shortage of science teachers

- Schools report difficulties recruiting teachers with physical sciences background
- An aging teaching workforce
- Uncertainty among young and early career teachers



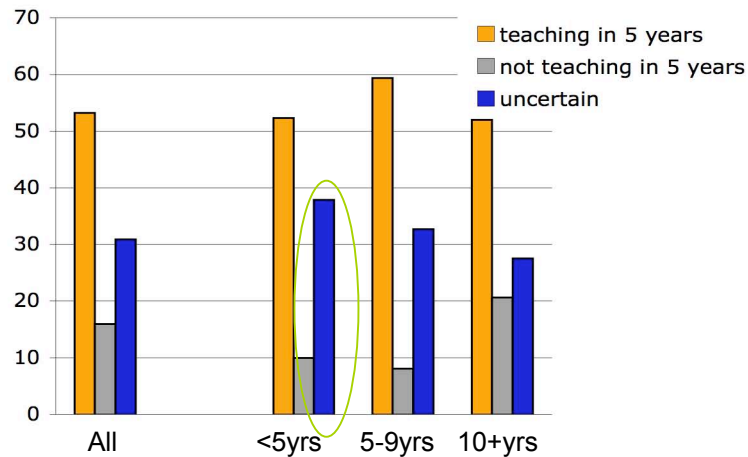
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Younger teachers uncertain about their career plans



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Early career teachers uncertain about their career plans



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Workload an issue for many

The huge number of hours required for preparation and correction out of school time, including weekends and holiday (families resent this)

[female teacher, <30 years of age]

High demand on time at certain times of the year – unrealistic sometimes – to the point where there can be no life outside school business for several weeks

[female teacher, <35 years of age]



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Student attitude and behaviour discourages many

Far too much time is wasted on discipline and classroom management rather than actual education
[teacher with >10 years experience]

Teachers are expected to do more and more – to be experts in social welfare, to deal with complex family dynamics of students ... and then to actually teach *[teacher]*



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Curriculum concerns

(The) curriculum framework is totally ruining the creative nature of teaching science. Everything is too theoretical. I will not be teaching science next year because I am restricted and forced to teach theory and do less practical work which I love

VCE Biology units 1-4 have too much content. The students have to try to cram in way too much info. No time to talk about/discuss other issues/topics not directly related
[teacher <10 years experience]

Change of science syllabus and philosophy every 5 years



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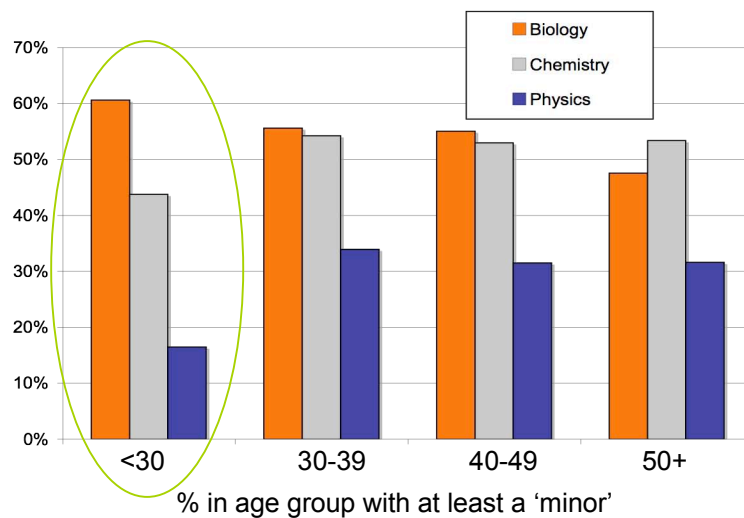
There is a current and growing shortage of science teachers

- Schools report difficulties recruiting teachers with physical sciences background
- An aging teaching workforce
- Uncertainty among young and early career teachers
- Younger and early career teachers are predominantly 'biologists'



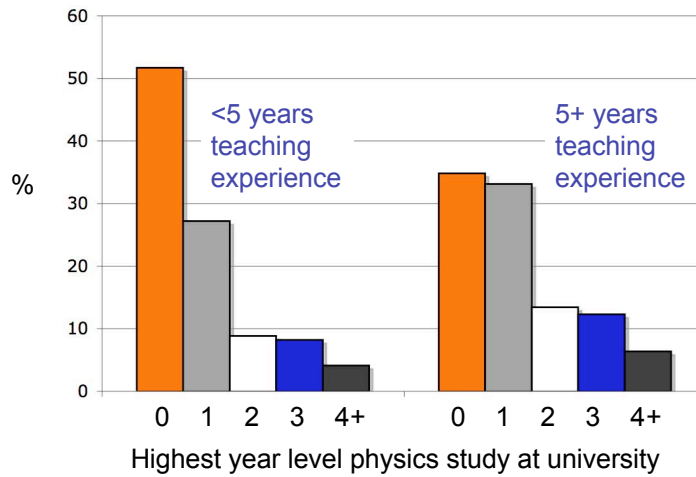
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Youngest teachers (<30) have studied less physics



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Early career teachers (<5yrs) have studied less physics



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Match between disciplinary background and teaching responsibilities

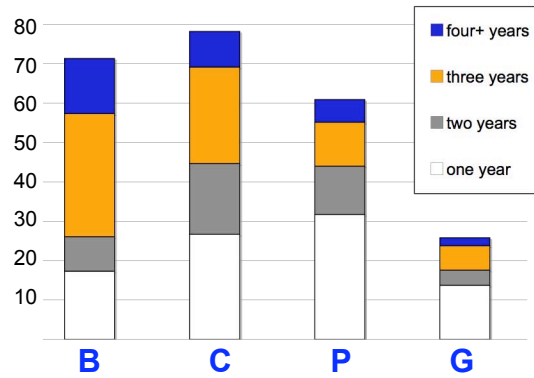
- Diversity of disciplinary background and patterns of teaching



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Science teachers are diverse in their disciplinary background

- 72% have science-based degree
 - eg Bach.Science
- 25% have education-based degree
 - eg Bach.Education-(science)



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Science teachers are diverse in their patterns of teaching

J	M	S	%
			10.4
			20.3
			11.0
			4.6
			13.3
			22.1
			18.3
598	701	649	



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Match between disciplinary background and teaching responsibilities

- Diversity of disciplinary background and patterns of teaching
- 3/4 junior school teachers and middle school teachers had a science major, most commonly in biology
- 10% teachers taught only junior science - this group was less experienced and many lacked a tertiary science background



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Teachers of junior school science (Yrs 7-8)

Early career, female, and lowest levels of science background

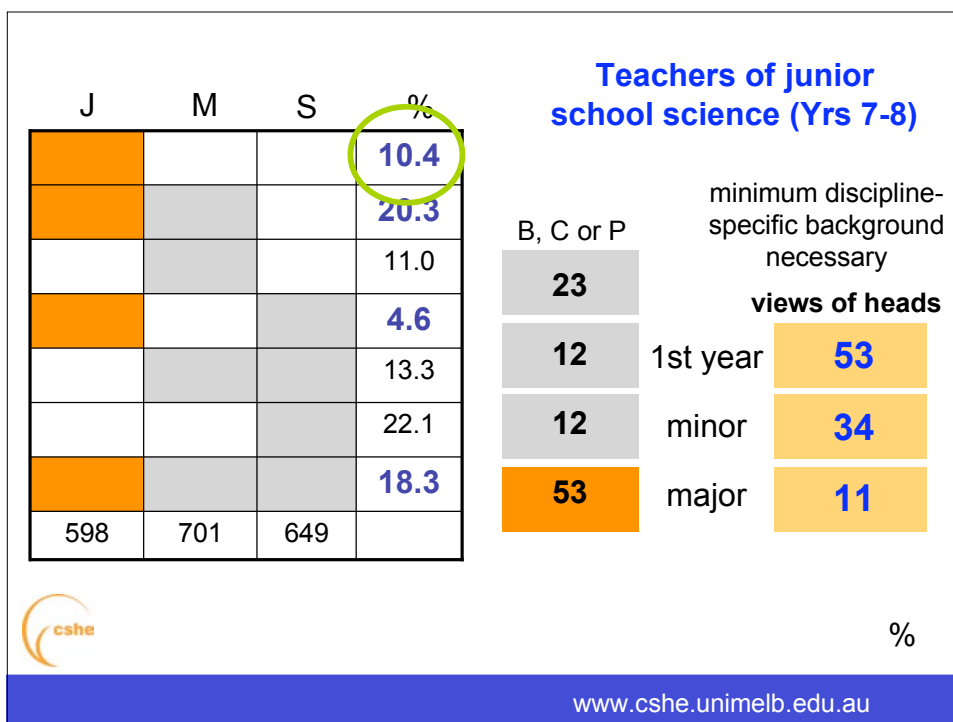
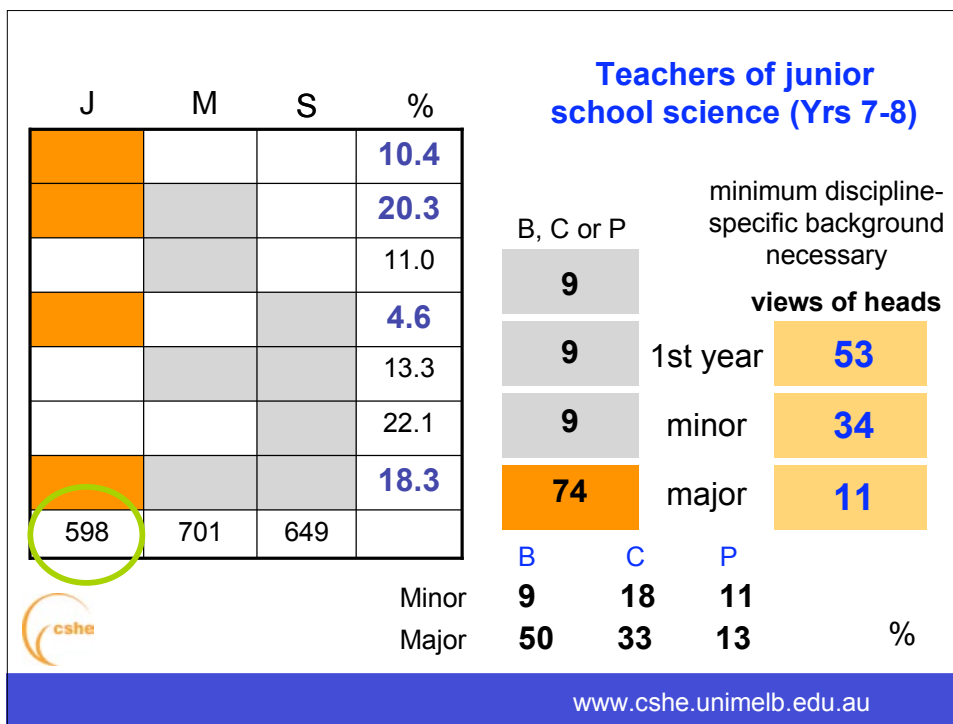
56% female (cf 47%)

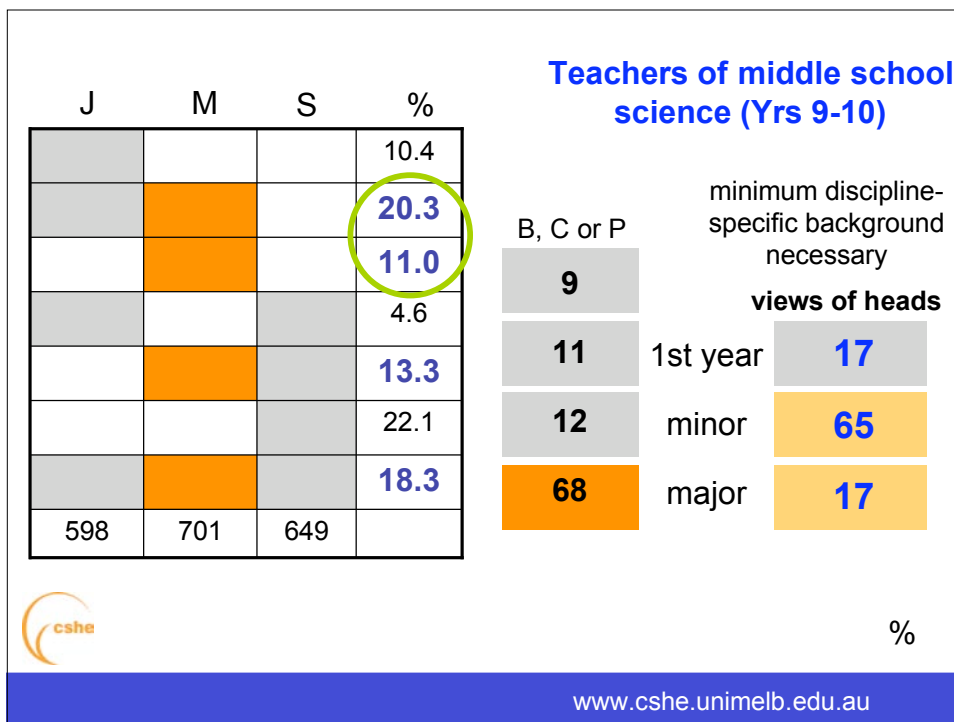
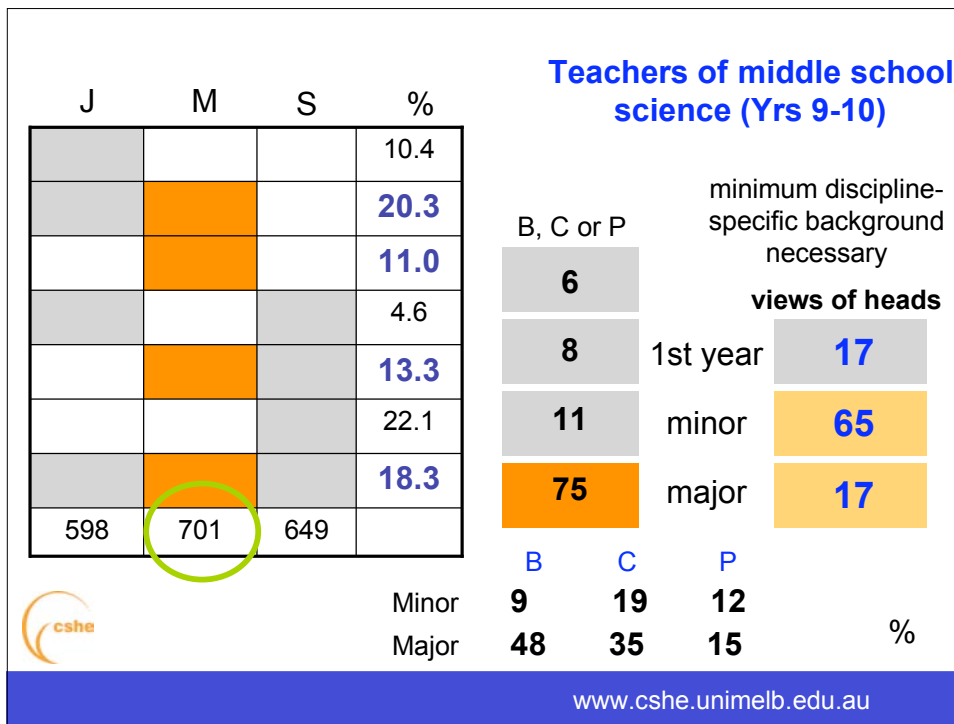
39% less 5 yrs exp (cf 26%)

22% with no science study (cf 8%)



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Match between disciplinary background and teaching responsibilities

- Diversity of disciplinary background and patterns of teaching
- 3/4 junior school teachers and middle school teachers had a science major, most commonly in biology
- 10% teachers taught only junior science - this group was less experienced and many lacked a tertiary science background
- Most senior school science teachers had a science background, but many lacked a discipline-specific major. This was most pronounced for Physics.



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J	M	S	%
			10.4
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Teachers of senior school science (Yrs 11-12)

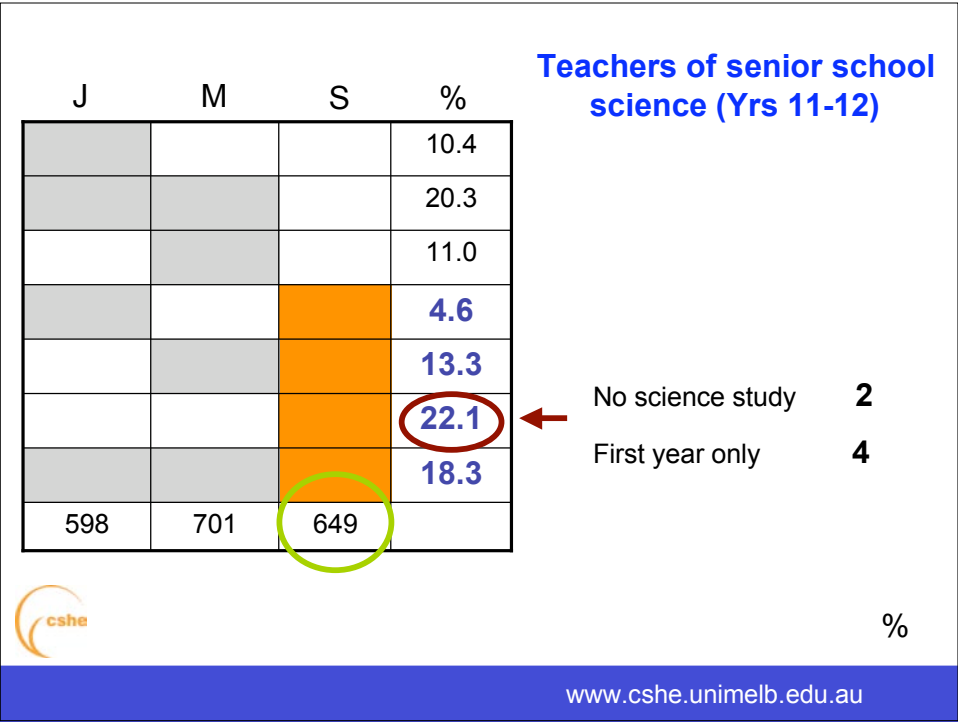
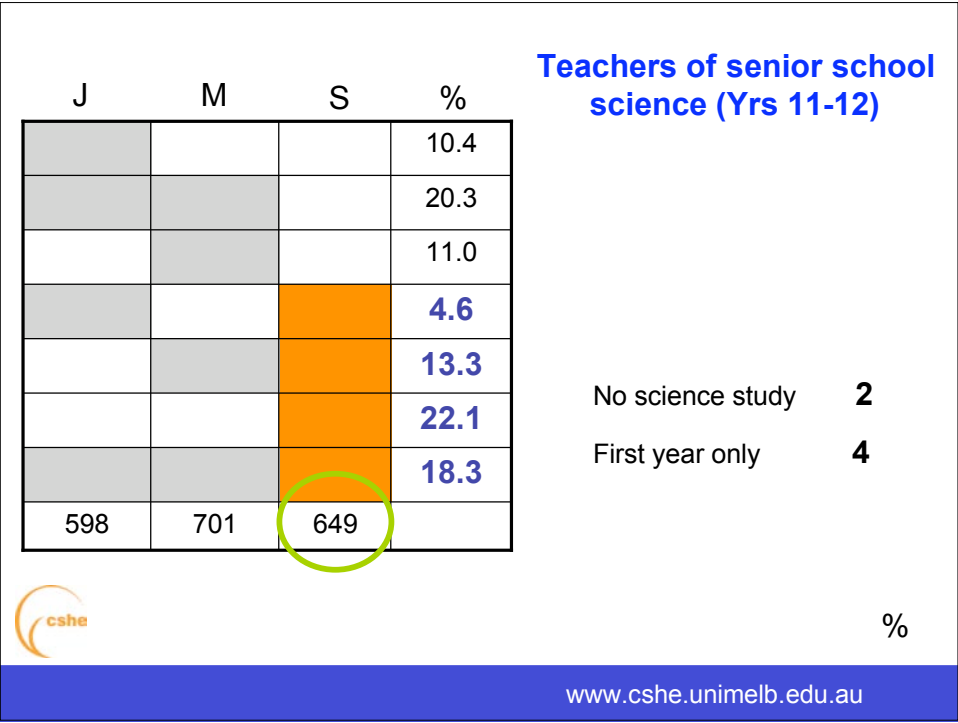
47% male
24% 50 years+

57% male
33% 50 years+

Chemistry teachers oldest group
37% 50 years+



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Teachers of senior school science (Yrs 11-12)

minimum discipline-specific background necessary		Biology	Chemistry	Physics
views of heads		4.1	4.2	8.7
2	1st year	8.7	6.8	15.5
9	minor	6.7	14.7	17.4
89	major	80.5	74.2	58.4



%

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- Principal findings from *WTS*:
 - Current and looming shortage of science teachers
 - Disciplinary background of current teachers

Do these findings resonate with your own experiences?

comments or questions



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The issues for universities ...

From your perspective, what can universities do to help address the situation?



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Aspiring science teachers need tertiary preparation that provides them with the disciplinary knowledge appropriate to the teaching that they will do

How can this be ensured?



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Aspiring science teachers need tertiary preparation that provides them with the disciplinary knowledge appropriate to the teaching that they will do

“... the teachers who have a Science degree have a much better Science knowledge while some of the teachers who did it in education faculty have very limited science knowledge”

“Science graduates complete their degree courses with a breadth of experience and understanding of science that is more than just "doing some science units" within an Education Faculty”



“Students who come from an Education faculty often have less than adequate basic understanding of the discipline. They are OK for Yr 8 & 9 but Yr 10 plus is a problem in many instances”

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Aspiring science teachers need tertiary preparation that provides them with the disciplinary knowledge appropriate to the teaching that they will do

“I consider that the teachers that get their science training from an Education faculty have a better understanding of the science required by the students”

“*Grad dips* are sometimes not in touch with the "real world" of teaching. Their expectations are often different”



“Though unit(s) taught within a Science Faculty will prepare you content wise, those taught within the Education Faculty prepare you as a teacher (breaking down concepts to enable student(s) to understand them)”

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More young people need to be encouraged to pursue
a career teaching science in secondary schools

*What can universities do to
achieve this?*



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More young people need to be encouraged to pursue
a career teaching science in secondary schools

“I did an integration program as a part of my undergraduate
studies involving working in state schools in classrooms. This
encouraged me, and many of the other students in this
program, to think about teaching”
[teacher <3 years experience]



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More young people need to be encouraged to pursue
a career teaching science in secondary schools

“I knew nothing of science teaching during undergraduate
years. It needs promoting at universities for those doing
Science”

[teacher >50 years of age]



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Soon to be released:

Mathematics

2924 teachers and 612 heads

30 per cent of the nation's secondary schools



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