Adoption of new Computer Science high school standards by New Zealand teachers

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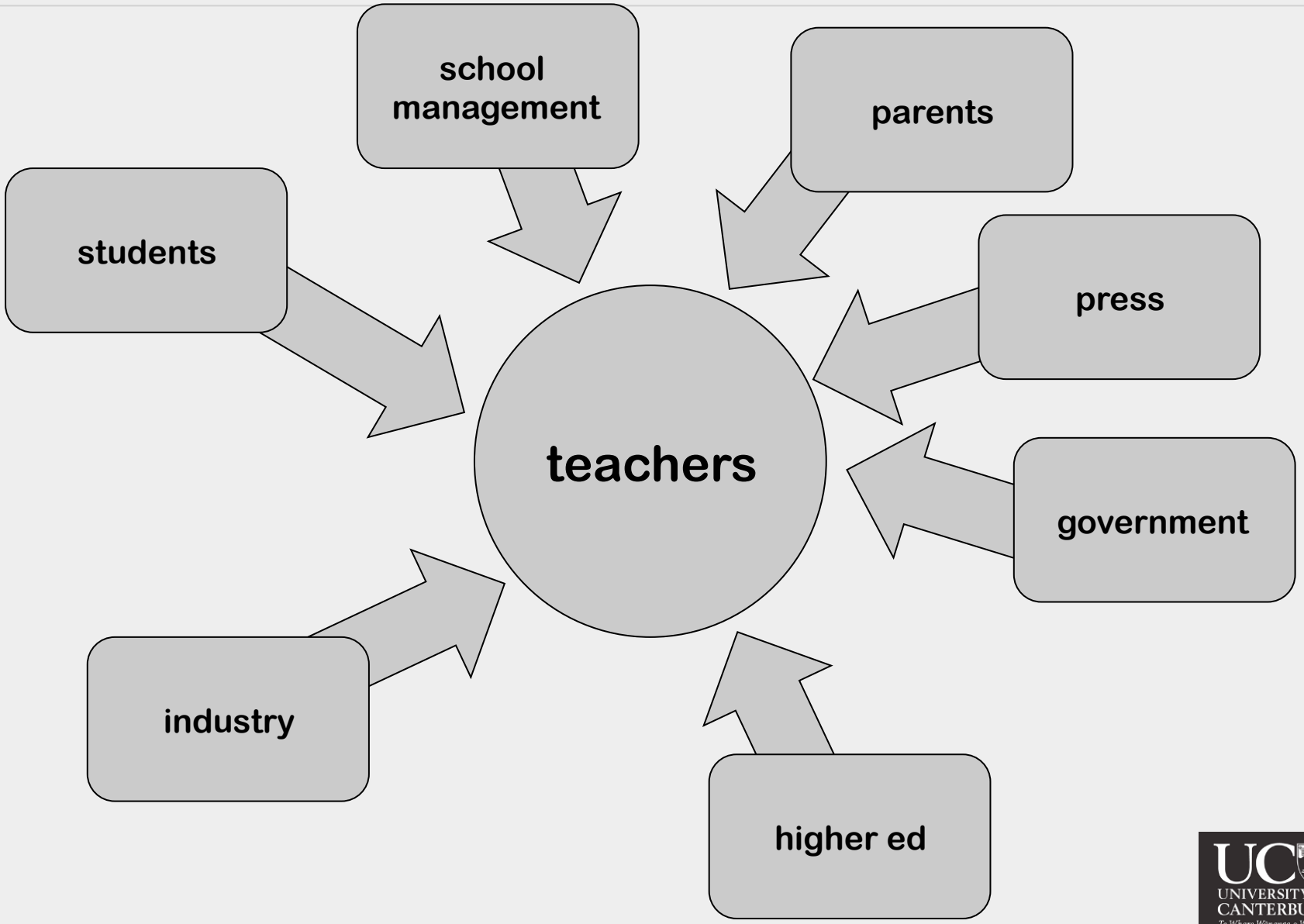
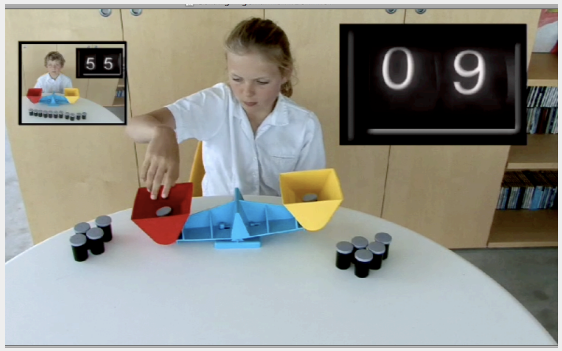
Teachers are the lynchpin



Level 1 Computer science

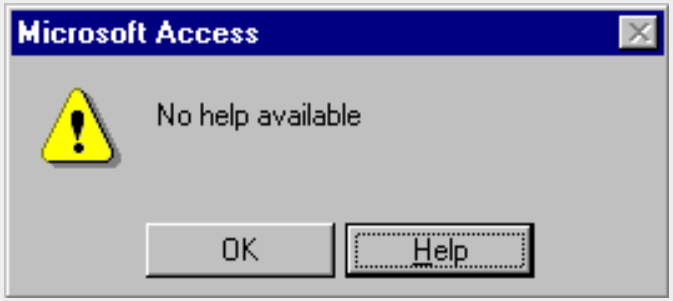
- Algorithm comparisons



- Programming languages

```
user1$ gcc selectionSort.c
user1$ ./a.out
Setting up array...
Selection sort demo with 50000 items...
Finished test
user1$
```

- Human Computer Interaction



AS91074

Achievement Standard

Subject Reference Digital Technologies 1.44

Title Demonstrate understanding of basic
science

Level 1 **Credits** 3 **A**

Subfield Technology

Domain Digital Technologies

Status Registered **Status date**

Planned review date 31 December 2014 **Date version p**

This achievement standard requires demonstrating understan
computer science.

Achievement Criteria

Achievement	Achievement with Merit
• Demonstrate understanding of basic concepts from computer science.	• Demonstrate in-depth understanding of basic concepts from computer science.

Explanatory Notes

1 This achievement standard is derived from the Level 6 a
the Technology learning area in *The New Zealand Curri*
Ministry of Education, 2007, and is related to the materia
Learning Guide for Technology, Ministry of Education, 2
http://seniorsecondary.tki.org.nz.

Further information can be found at http://www.techlink.

2 *Demonstrate understanding of basic concepts from com*
- describing the key characteristics and roles of algorit
instructions
- describing an algorithm for a task, showing understar
that can be in an algorithm, and determining the cost
problem of a particular size

- describing the role and characteristics of programming languages, including the different roles and characteristics of high level languages and low level (or machine) languages, and the function of a compiler
- describing the role of a user interface and factors tha

Demonstrate in-depth understanding of basic concepts f
involves:
- explaining how algorithms are distinct from related co
and informal instructions
- showing understanding of the way steps in an algorit
combined in sequential, conditional, and iterative stru
cost of an iterative algorithm for a problem of size *n*
- explaining how the characteristics of programming la
different characteristics of high level and low level (o
important for their roles
- explaining the need for programs to translate betwee
languages
- explaining how different factors of a user interface co

Demonstrate comprehensive understanding of basic cor
computer science involves:
- comparing and contrasting the concepts of algorithm
instructions
- determining and comparing the costs of two different
same problem of size *n*
- comparing and contrasting high level and low level (c
explaining different ways in which programs in a high
are translated into a machine language
- discussing how different factors of a user interface co
comparing and contrasting related interfaces.

3 The *basic concepts from computer science* are: the conc
concept of a programming language; and the concept of
usability.

4 An algorithm is a precise unambiguous specification of h
computational task in a finite number of well-defined ste
from a computer program. An algorithm has a cost (the
perform) for a task. Different algorithms for the same ta

5 A programming language is a precise, formal language f
be run on a computer; it is distinct from pseudocode and
are different levels of programming languages; programs
level to low level (or machine) languages.

6 A user interface is the part of a computer or electronic sy
interacts with to control the system. The usability of an i
characteristic for evaluating an interface.

7 Assessment Specifications for this achievement standar
the Technology Resources page found at http://www.nzq

Quality Assurance

1 Providers and Industry Training Organisations must be accredited by NZQA before they can register credits from assessment against achievement standards.

2 Accredited providers and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Accreditation and Moderation Action Plan (AMAP) reference 0233

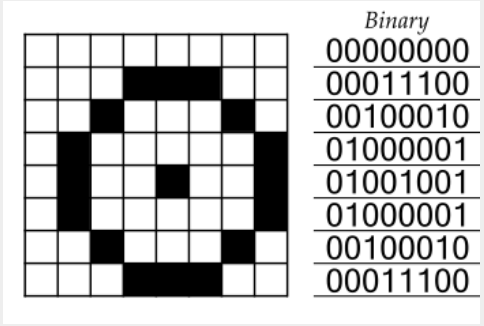
Excellence

Demonstrate comprehensive understanding of basic computer science concepts from computer science involves:

- comparing and contrasting the concepts of algorithms, programs, and informal instructions
- determining and comparing the costs of two different iterative algorithms for the same problem of size *n*
- comparing and contrasting high level and low level (or machine) languages, and explaining different ways in which programs in a high level programming language are translated into a machine language
- discussing how different factors of a user interface contribute to its usability by comparing and contrasting related interfaces

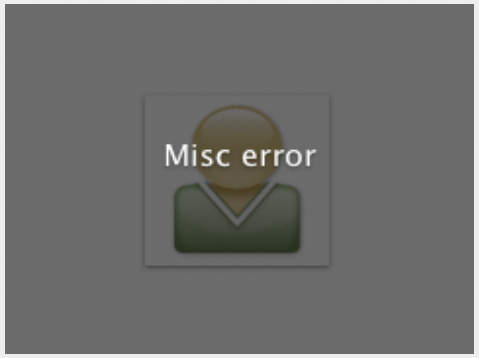
Level 2 Computer Science

- representing data using bits



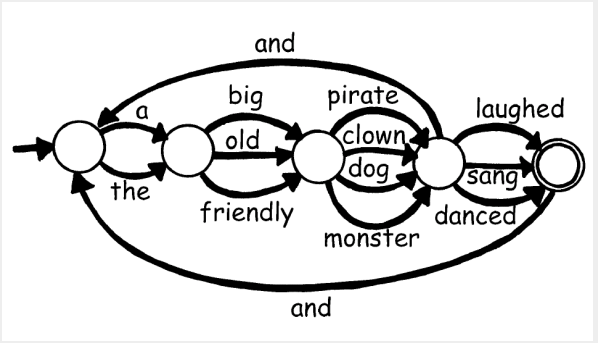
- encoding: compression, error, encryption

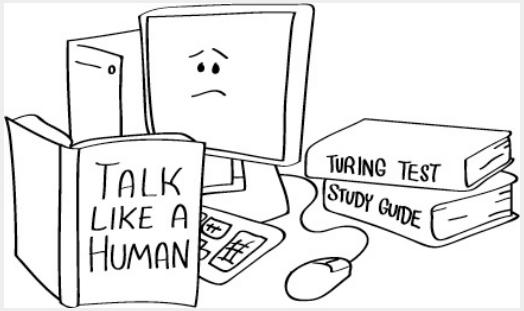
- HCI and usability heuristics



Level 3 Computer Science

- formal languages
- network communication protocols
- complexity and tractability
- intelligent systems
- software engineering
- graphics and visual computing





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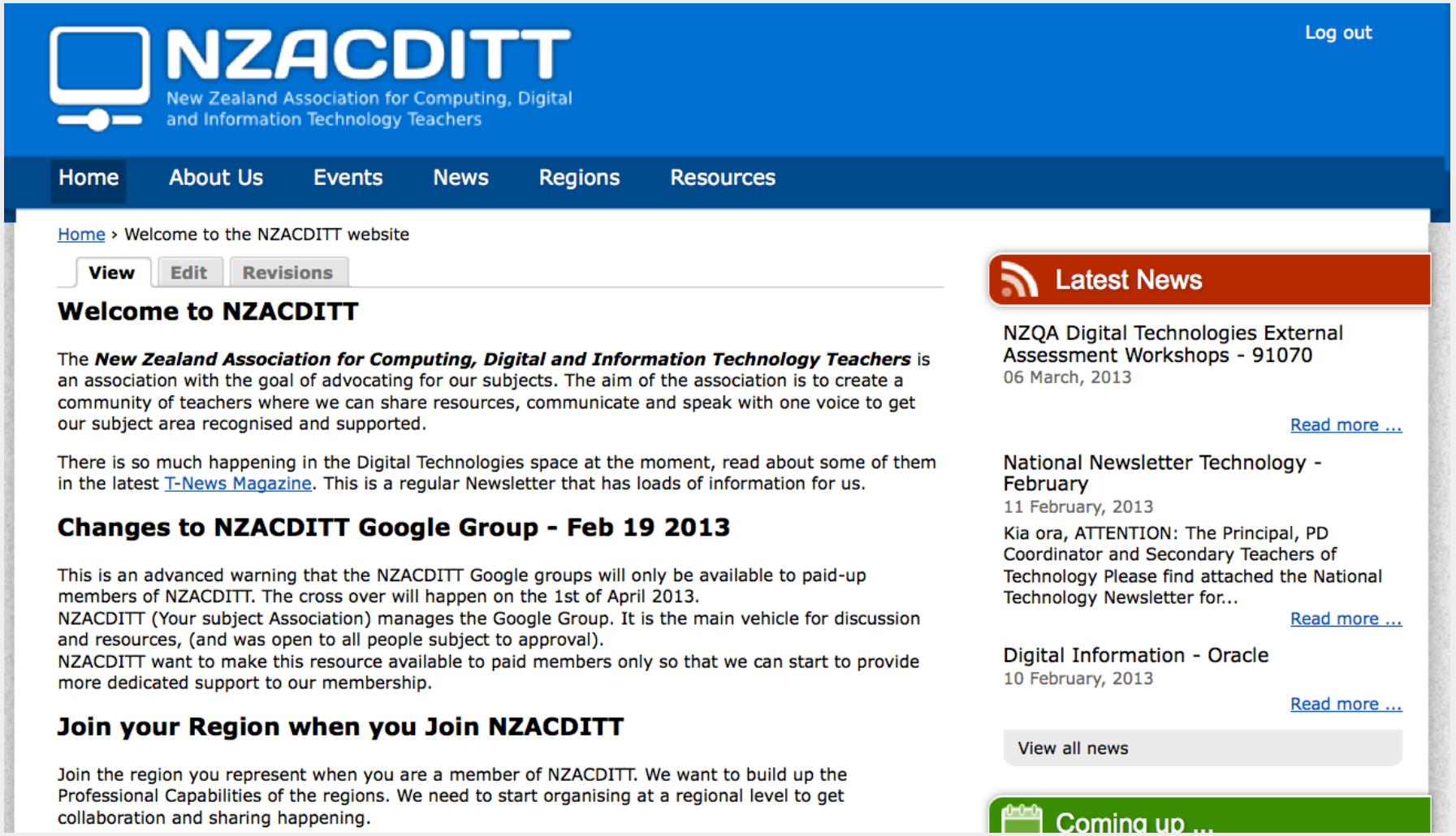

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Surveys

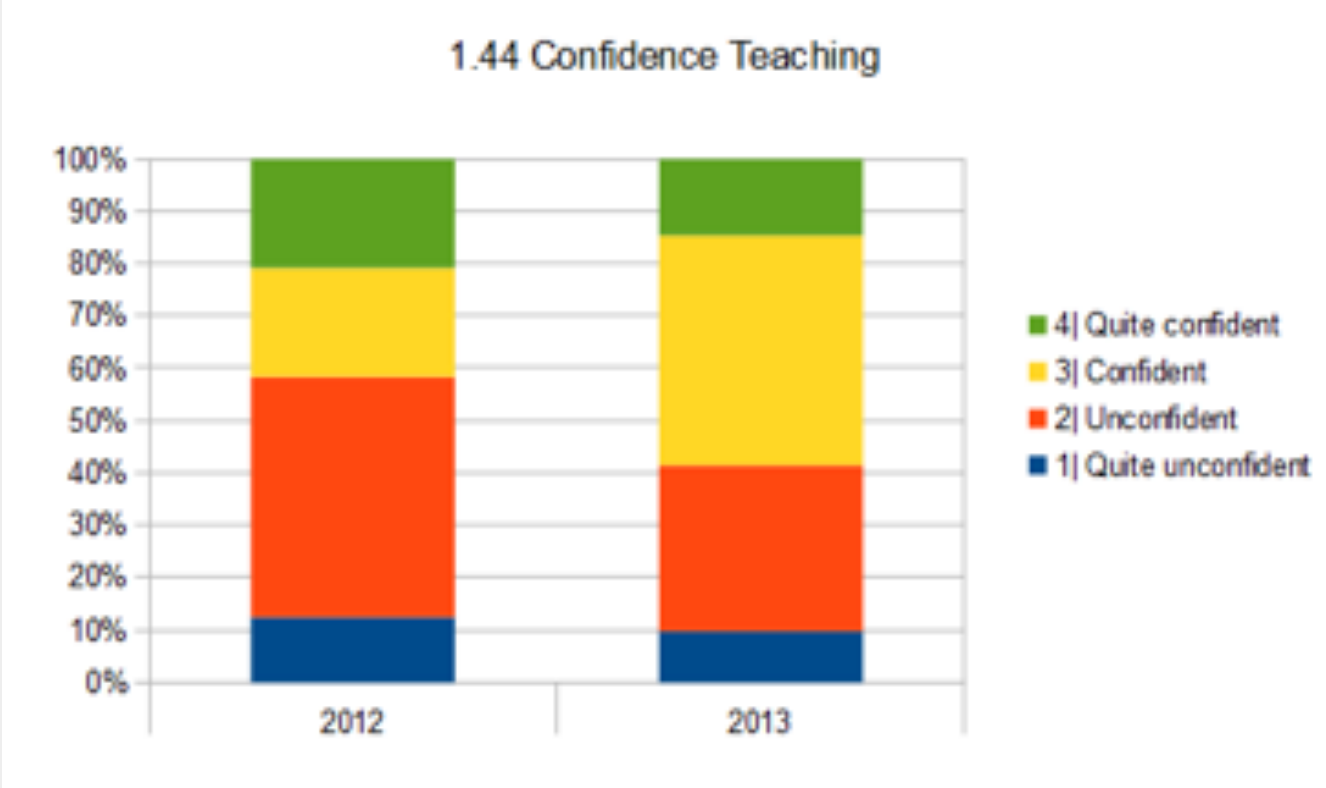
	Feb 2012	May 2013
Respondents	89	109
Size of mailing list	404	216
Response rate	22.0%	50.5%
Number of different schools	69	87
Male/Female	48.9%/51.1%	50.5%/49.5%
50+ years old	60.4%	56.0%

- Comparing only teachers from same schools (40 in common)

Qualification (2012)

- 56% have a computing qualification
- 11% have a CS degree

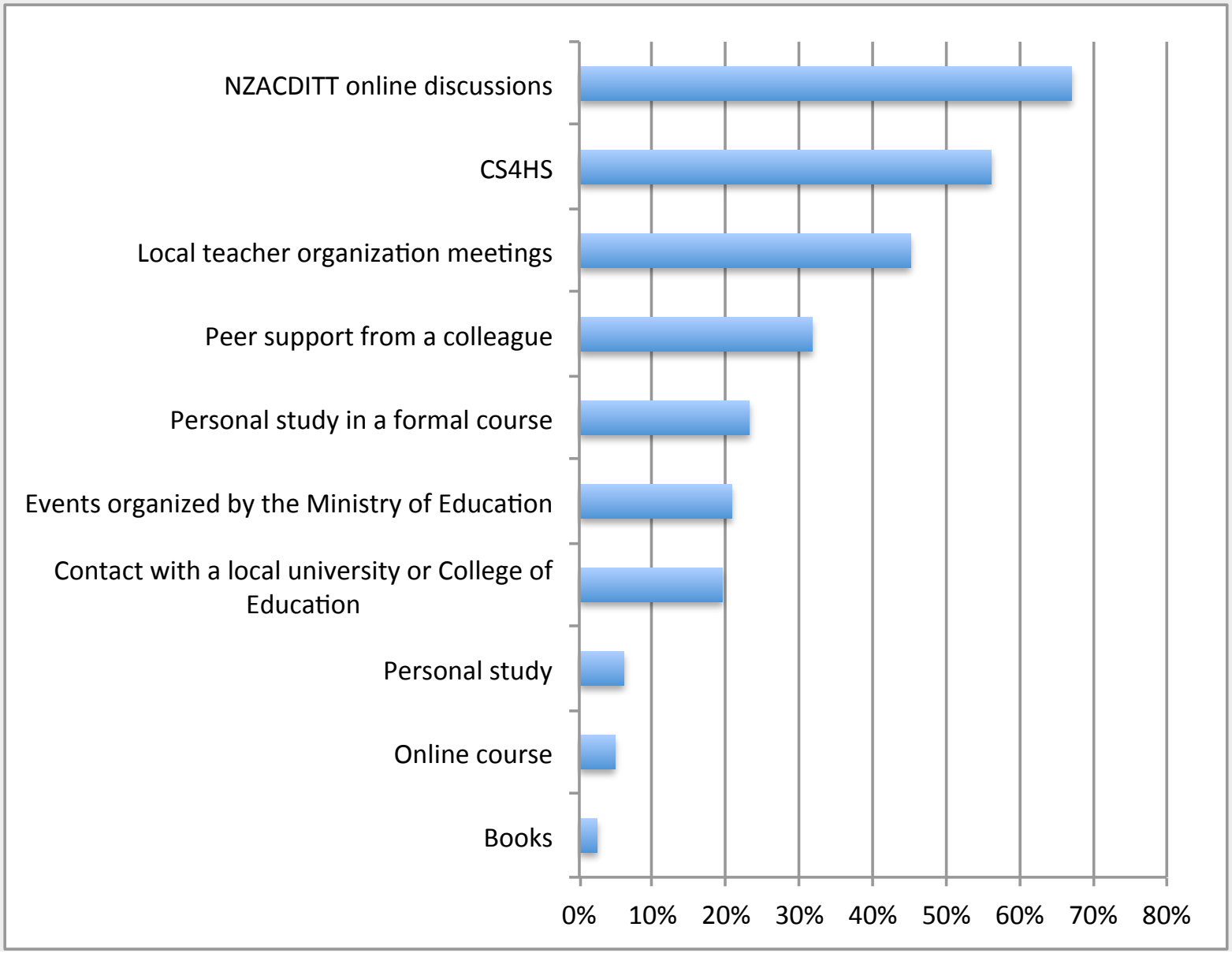
Confidence teaching?



Fair assessment

- 2.75 (2012) to 2.86 (2013)
- 5% (2012) to 0 (2013)
  strongly disagree

Sources of Professional Development



Adoption of 1.44 standard

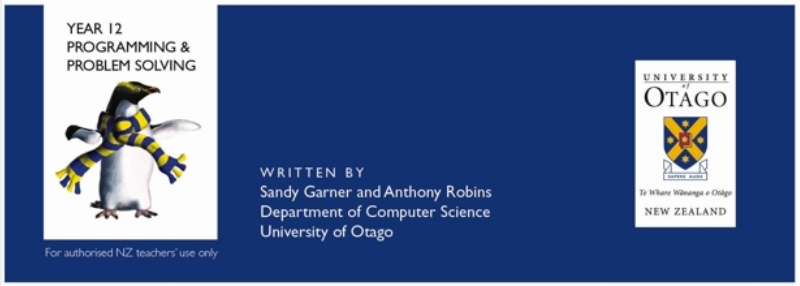
- Local support or formal study:
  60% did not adopt
- Peer support, university contact and CS4HS:
  30% did not adopt

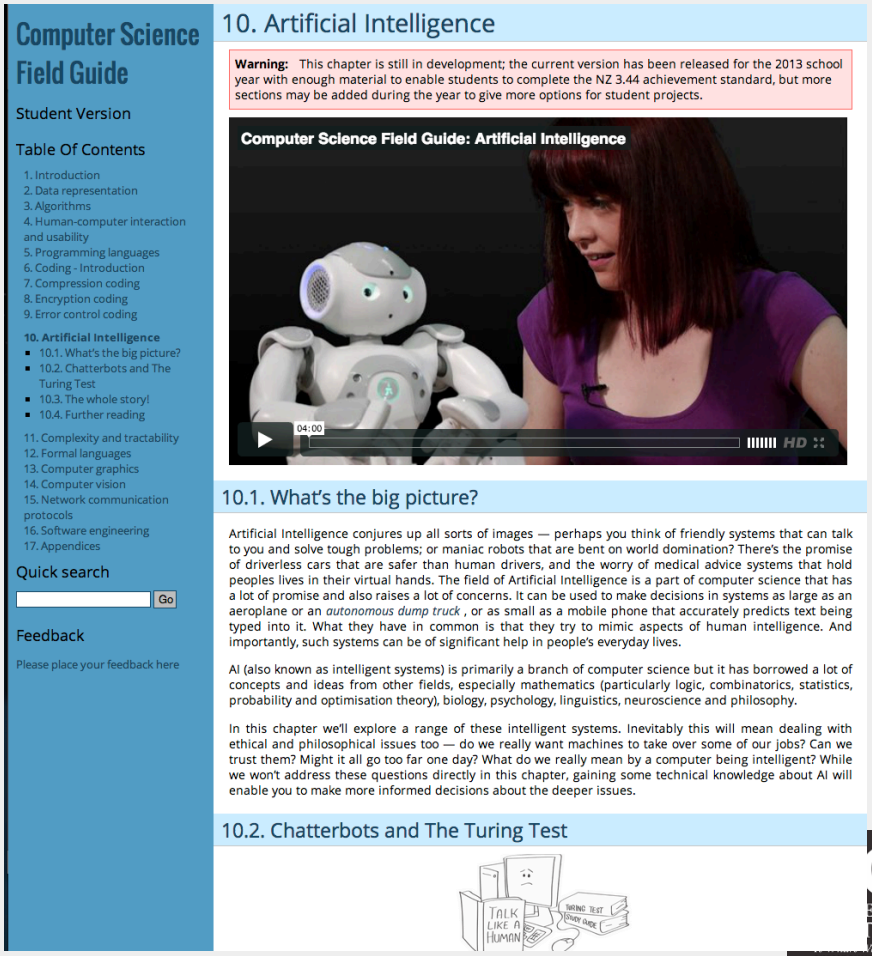
Financial support for PD

- 42% good support
- 50% partial support
- 7% self funded
- Biggest issues:
  Time
  Opportunities
  Overwhelmed/exhausted

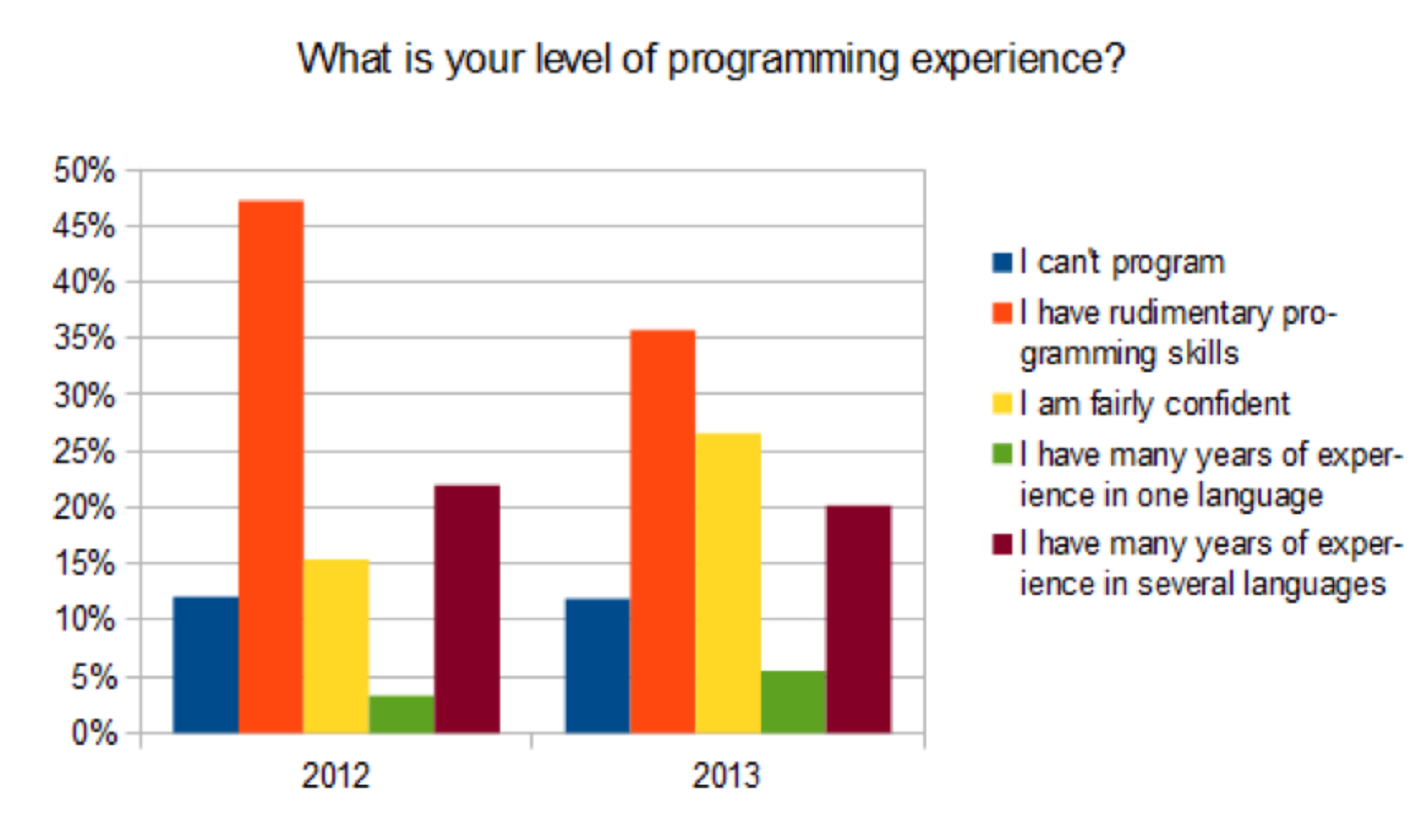
Resources used

CODE AVENGERS





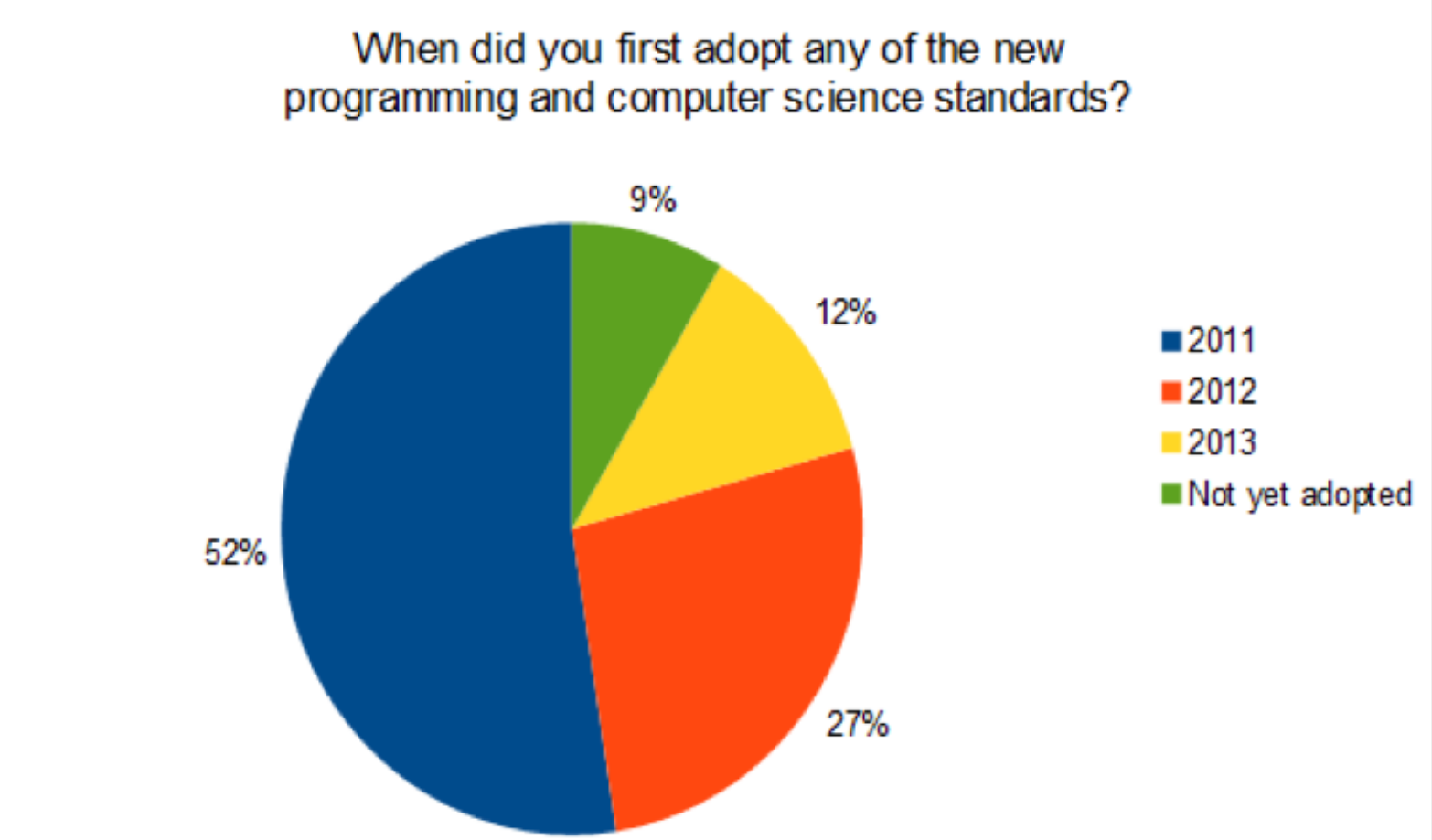
Programming ability (2012)



Student achievement

- 21% to 30% female
- Female achievement: 2.23
- Male achievement: 2.06

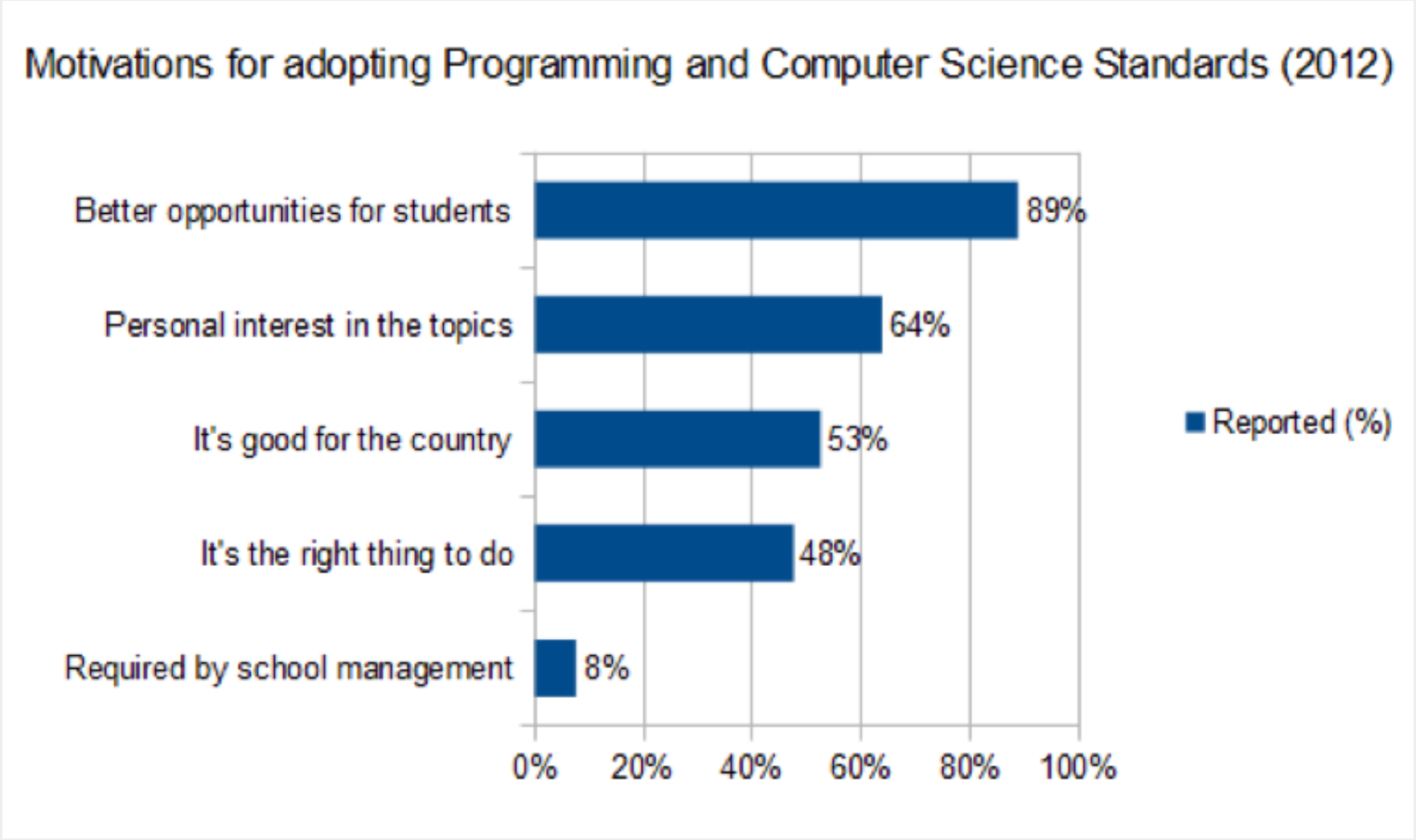
First adopted standards



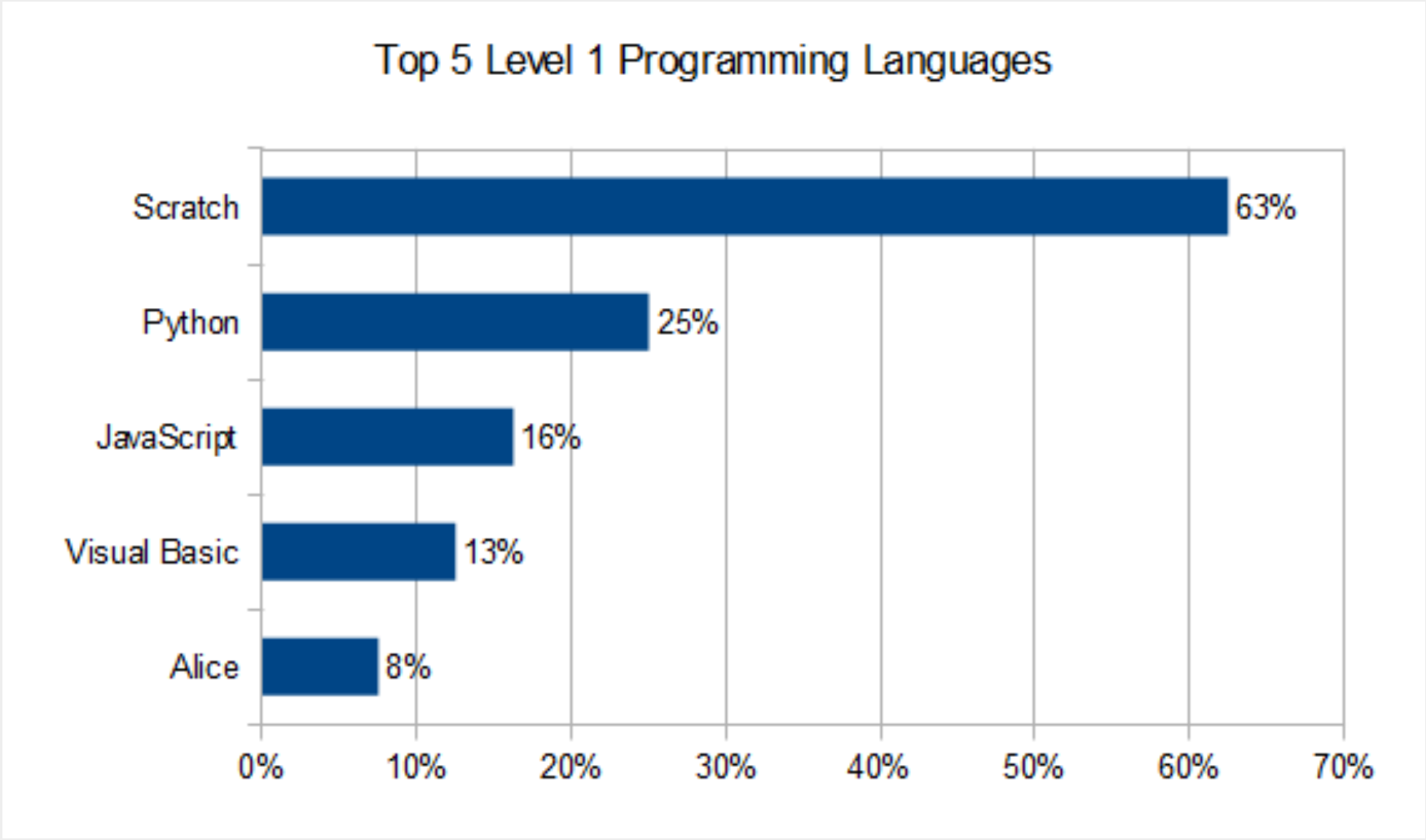
Areas of Digital Technologies

	Feb 2012	May 2013	change
Digital information	84.3%	84.8%	+0.5%
Digital infrastructure	41.2%	32.6%	-8.6%
Digital media	90.2%	93.5%	+3.3%
Electronics	9.8%	15.2%	+5.4%
Programming and computer science	62.7%	82.6%	+19.9%

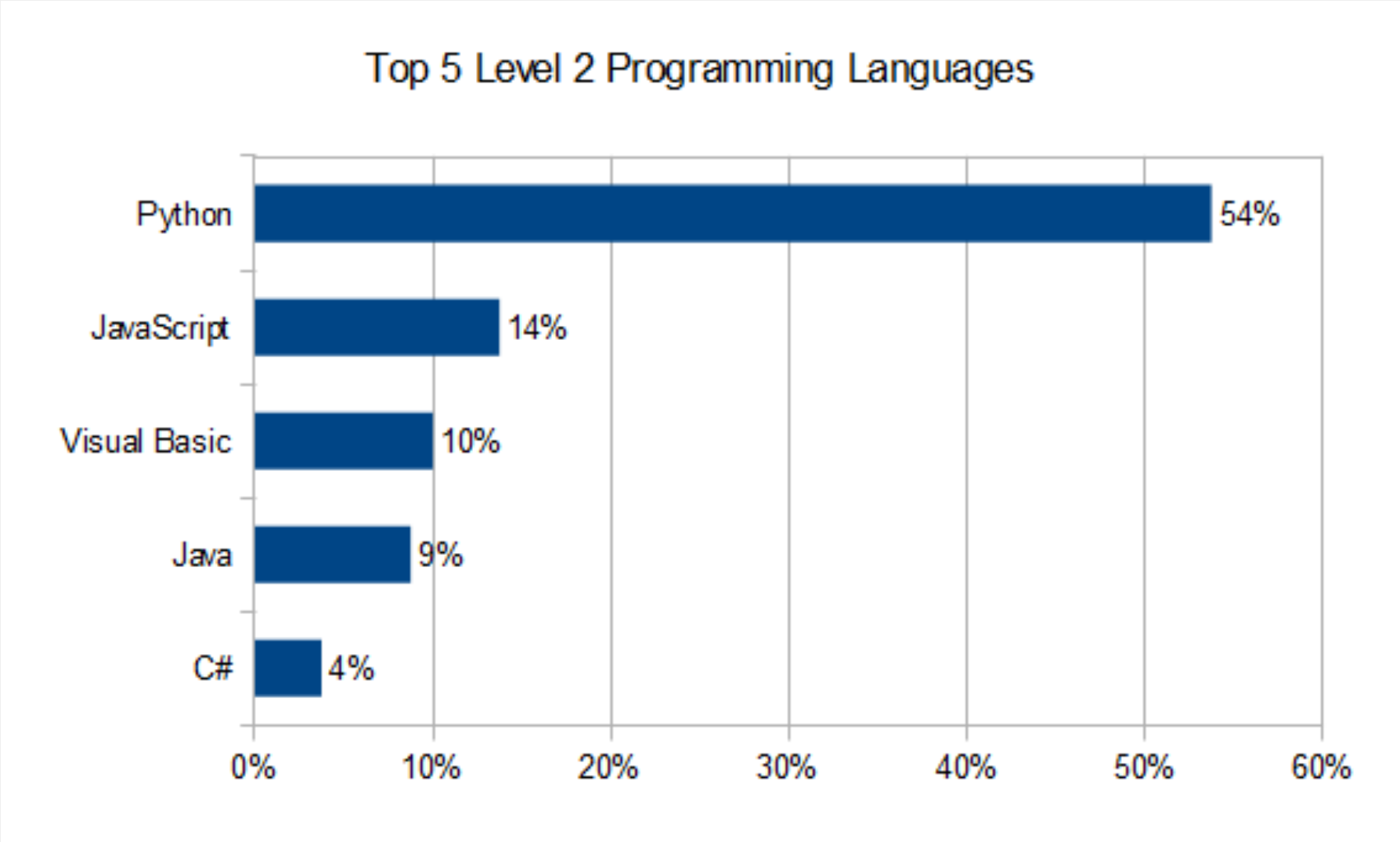
Motivation for change



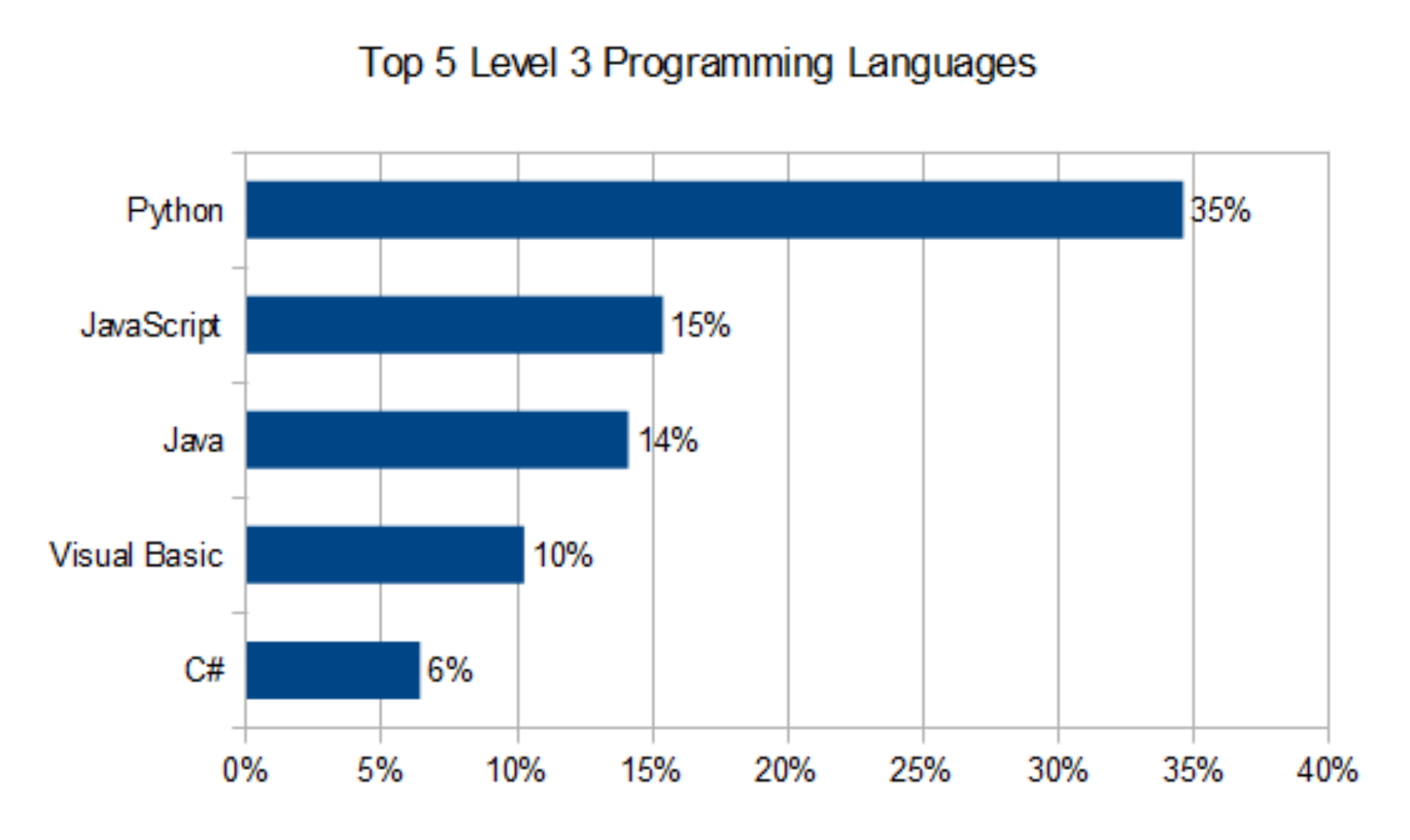
Programming languages: Level 1



Programming languages: Level 2



Programming languages: Level 3



Themes

- "Hopefully, the work load will ease as courses settle in"
- "I am now into my third year with the [Year 11] students and feel really confident delivering the standards"
- "Educating other staff (still) that this is not a typing class"
- Workload significantly higher than that required for other subjects
- Quality of students attracted

We had this years DUX in the subject this year. I have two contenders for next yrs DUX in this years yr12 programming class…. I am finding it a bit daunting … We are growing, and keeping students. They love the new standards. I am now worried about the lower ability students …

25% of my year 13's (65 kids) are going to be studying CS in uni next year. Very exciting.

Almost worth ALL the work.

Tuesday, 12 November 2013 6:24 PM

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