Adoption of new Computer Science high school standards by New Zealand teachers
Teachers are the lynchpin

- students
- school management
- parents
- press
- government
- industry
- higher ed
- teachers
Level 1 Computer science

- Algorithm comparisons
- Programming languages
- Human Computer Interaction

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

**Number** AS91074  
**Version** 1

**Title** Demonstrate understanding of basic computer science.

**Level** 1  
**Credits** 3  
**Achievement Standard**

This achievement standard requires demonstrating understanding of basic computer science.

**Achievement Criteria**

<table>
<thead>
<tr>
<th>Achievement</th>
<th>Achievement with Merit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Demonstrate understanding of basic concepts from computer science.</td>
<td>• Demonstrate in-depth understanding of basic concepts from computer science.</td>
</tr>
</tbody>
</table>

**Explanatory Notes**


Further information can be found at [http://seniortertiary.tki.org.nz](http://seniortertiary.tki.org.nz).

2. Demonstrate understanding of basic concepts from computer science:
   - describing the key characteristics and roles of algorithms
   - describing an algorithm for a task, showing understanding that can be in an algorithm, and determining the cost of a particular task.

3. The basic concepts from computer science are: the concept of a programming language; the concept of a computational task; the concept of a user interface; and the concept of usability.

4. An algorithm is a precise unambiguous specification of steps that can be performed by a human or electronic system to perform a computational task in a finite number of well-defined steps. An algorithm can be translated from a computer program. An algorithm has a cost (the number of steps it will perform) for a task. Different algorithms for the same task may have different costs.

5. A programming language is a precise, formal language that can be run on a computer; it is distinct from pseudocode and is different from a computer program. There are different levels of programming languages; programs written in high level languages are translated into machine language.

6. A user interface is the part of a computer or electronic system that interacts with to control the system. The usability of an interface is important for their roles.

7. Assessment Specifications for this achievement standard can be accessed through the Technology Resources page found at [http://seniortertiary.tki.org.nz](http://seniortertiary.tki.org.nz).

**Qualification**

**Number** AS91074  
**Version** 1

**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
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
Welcome to NZACDITT

The New Zealand Association for Computing, Digital and Information Technology Teachers is an association with the goal of advocating for our subjects. The aim of the association is to create a community of teachers where we can share resources, communicate and speak with one voice to get our subject area recognised and supported.

There is so much happening in the Digital Technologies space at the moment, read about some of them in the latest T-News Magazine. This is a regular Newsletter that has loads of information for us.

Changes to NZACDITT Google Group - Feb 19 2013

This is an advanced warning that the NZACDITT Google groups will only be available to paid-up members of NZACDITT. The cross over will happen on the 1st of April 2013. NZACDITT (Your subject Association) manages the Google Group. It is the main vehicle for discussion and resources, (and was open to all people subject to approval).

NZACDITT want to make this resource available to paid members only so that we can start to provide more dedicated support to our membership.

Join your Region when you Join NZACDITT

Join the region you represent when you are a member of NZACDITT. We want to build up the Professional Capabilities of the regions. We need to start organising at a regional level to get collaboration and sharing happening.
### Surveys

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

- Comparing only teachers from same schools (40 in common)
Qualification (2012)

- 56% have a computing qualification
- 11% have a CS degree
Confidence teaching?

1.44 Confidence Teaching

2012

2013

4 | Quite confident
3 | Confident
2 | Unconfident
1 | Quite unconfident
Fair assessment

- 2.75 (2012) to 2.86 (2013)
- 5% (2012) to 0 (2013)
  strongly disagree
Sources of Professional Development

- NZACDITT online discussions
- CS4HS
- Local teacher organization meetings
- Peer support from a colleague
- Personal study in a formal course
- Events organized by the Ministry of Education
- Contact with a local university or College of Education
- Personal study
- Online course
- Books
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
Computer Science in NZ Schools – teacher adoption

Resources used
Programming ability (2012)

What is your level of programming experience?

- I can’t program
- I have rudimentary programming skills
- I am fairly confident
- I have many years of experience in one language
- I have many years of experience in several languages

2012:
- I can’t program: 45%
- I have rudimentary programming skills: 25%
- I am fairly confident: 15%
- I have many years of experience in one language: 10%
- I have many years of experience in several languages: 5%

2013:
- I can’t program: 40%
- I have rudimentary programming skills: 35%
- I am fairly confident: 20%
- I have many years of experience in one language: 10%
- I have many years of experience in several languages: 5%
Student achievement

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

When did you first adopt any of the new programming and computer science standards?

- 2011: 52%
- 2012: 27%
- 2013: 12%
- Not yet adopted: 9%
# Areas of Digital Technologies

<table>
<thead>
<tr>
<th>Area</th>
<th>Feb 2012</th>
<th>May 2013</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital information</td>
<td>84.3%</td>
<td>84.8%</td>
<td>+0.5%</td>
</tr>
<tr>
<td>Digital infrastructure</td>
<td>41.2%</td>
<td>32.6%</td>
<td>-8.6%</td>
</tr>
<tr>
<td>Digital media</td>
<td>90.2%</td>
<td>93.5%</td>
<td>+3.3%</td>
</tr>
<tr>
<td>Electronics</td>
<td>9.8%</td>
<td>15.2%</td>
<td>+5.4%</td>
</tr>
<tr>
<td>Programming and computer science</td>
<td>62.7%</td>
<td>82.6%</td>
<td>+19.9%</td>
</tr>
</tbody>
</table>
Motivation for change

Motivations for adopting Programming and Computer Science Standards (2012)

- Better opportunities for students: 89%
- Personal interest in the topics: 64%
- It's good for the country: 53%
- It's the right thing to do: 48%
- Required by school management: 8%
Programming languages: Level 1

Top 5 Level 1 Programming Languages

- Scratch: 63%
- Python: 25%
- JavaScript: 16%
- Visual Basic: 13%
- Alice: 8%
Programming languages: Level 2

Top 5 Level 2 Programming Languages

- Python: 54%
- JavaScript: 14%
- Visual Basic: 10%
- Java: 9%
- C#: 4%
Programming languages: Level 3

Top 5 Level 3 Programming Languages

- Python: 35%
- JavaScript: 15%
- Java: 14%
- Visual Basic: 10%
- C#: 6%
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
csfieldguide.org.nz

tim.bell@canterbury.ac.nz