Education Scotland
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# Computing Science in Local Authority Secondary Schools

January 2022

For Scotland's learners, with Scotland's educators

# Contents

# Introduction

This paper provides an overview of Computing Science delivery in Local Authority Secondary schools. Education Scotland carried out a survey of 356 schools between July 2021 and October 2021. The survey was promoted via local authority technologies leads, Computing Science teacher groups and Education Scotland officer contacts with local authorities and RICs. At the point of writing, the survey has had 309/356 unique local authority school responses. This represents 86.8% of local authority secondary schools. While this is the majority of schools, it is acknowledged that the survey data is not complete and that this paper should be treated as provisional in this respect.

The survey collected data relating to Computing teacher numbers, delivery of Computing Science in S1/2 and opportunities for learners to study Computing Science or related courses in the senior phase.

This paper does not look at specific data relating to the gender gap in Computing Science, which has been well documented recently. The purpose of the paper is to examine the provision of Computing Science nationally and identify areas where support could be offered.

The data relating to SQA qualifications has been taken from SQA website and supported by additional queries to the SQA enquiries team. Statistics and information - SQA

Additional data relating to teacher numbers in the 48 local authority schools who have yet to respond has been taken from a recent public **FOI request relating to Computing Science teacher numbers** in local authorities.

Data relating to attainment and deprivation has been taken from Insight.

Data relating to schools was taken from Pupil census: supplementary statistics - gov.scot (www.gov.scot)

# Survey of Computing Science Provision In Secondary Schools, Provisional Results

Education Scotland carried out a survey with local authority secondary schools regarding Computing Science delivery in schools. To date, 309/356 secondary schools have submitted a response to this survey (86.8%). Initial analysis of the 309 responses has highlighted the following:

## Computing Science Teacher FTE

- 273 schools state that they have a Computing Science teacher (512.48 FTE Computing Science teachers in total)
- 36/309 schools do not have a Computing Science teacher.

## Schools with single person Computing Science teachers

- 93 schools have 1 FTE Computing Science teachers (essentially single person departments). Using the collected data from external source, this number is 106. Additionally, 6 schools from the survey report having less than 1 FTE CS teachers; 8 schools when including external source data.
- 254 survey responses state that Computing Science as a subject is part of a faculty structure.
- 129 survey responses state the faculty head/curriculum leader/principal teacher is a registered Computing Science teacher
- There are 73 schools with a single Computing Science teacher (more than 0; less than or equal to 1 FTE) where the faculty head is not a Computing Science teacher
- There are 26 schools with a single Computing Science teacher (more than 0; less than or equal to 1 FTE) where the faculty head is a Computing Science teacher

## Provision of Computing Science in 36 Schools with zero FTE CS Teachers from Survey Data

- 23 schools have some level of CS provision in S1
- 21 schools have some level of CS provision in S2
- 27 (75%) schools are able to offer senior phase Computing Science to their learners via college partnership
- 17 (46%) schools are able to offer senior phase Computing Science to their learners via local authority provision.
- Schools that are classed as 'Very Remote Rural' or 'Remote Rural' are account for 50% of settings where there are no CS teachers (11/36 and 7/36 respectively). Of these 18 schools, 14 of them have a pupil role of less than 300. *Distribution of schools with no CS teacher from survey data:*

| | |
|---|---|
| Very Remote RRural | 11 |
| Remote rural areas | 7 |
| Large urban areas | 6 |
| Other urban areas | 3 |
| Accessible small towns | 4 |
| Accessible rural areas | 2 |
| Very Remote sSmall tTowns | 2 |
| Remote small towns | 1 |

# Collated Survey and External Data - FTE Computing Science Teachers

Using data from an external source to complete the Computing Science FTE teachers data collected from the survey of Local Authority secondary schools, the following information has been gathered.

Collated data suggests that:

- There are 553.53 FTE Computing Science teachers in 308 Local Authority secondary schools
- 48/356 schools have 0 FTE Computing Science Teachers 36 from survey, 12 from external source. (13.5%)

Using these figures, the pattern of schools classed as Very Remote Rural / Remote Rural remains similar. 16 of these schools are Very Remote Rural, 7 are Rural. 23/48 schools. *Distribution of class of school with 0 Computing Science teachers:*

| | |
|---|---|
| Very Remote Rural | 16 |
| Large urban areas | 8 |
| Remote rural areas | 7 |
| Other urban areas | 6 |
| Accessible small towns | 5 |
| Accessible rural areas | 3 |
| Very Remote ~~S~~small ~~T~~owns | 2 |
| Remote small towns | 1 |

20 schools with no Computing Science teacher have a school role of less than 300. Nationally, there are 36 schools that have a school role of less than 300.

## S1/2 Overall

278 / 309 (90% of responses) offer Computing Science*, either as discrete subject or as part of wider digital course or mixed with Business Education in S1.

- Of the 278 offers, 244 courses are delivered by, or with, Computing Science teachers.
- The average period length is 51 minutes
- The average number of Computing periods per week is 1.17

* *If schools who have not responded all report no Computing Science experiences in S1, this could be 278/356 (78%)*
*If schools who have not responded all report they do offer Computing Science experiences in S1, this could be 325/356 (91.3%)*

280 / 309 (91% of responses) offer Computing Science**, either as a discrete subject or as part of wider digital course or mixed with Business Education in S2.

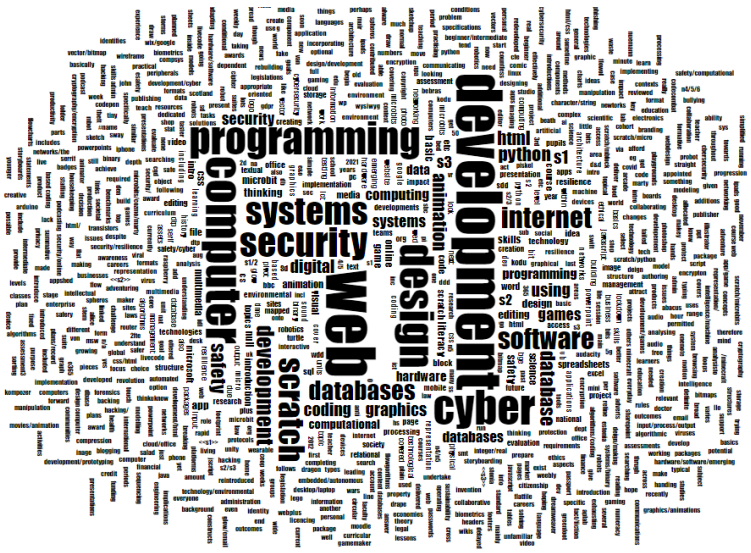
- Of the 280 offers, 247 courses are delivered by, or with, Computing Science teachers.
- The average period length is 51 minutes
- The average number of Computing periods per week is 1.18

** *If schools who have not responded all report no Computing Science experiences in S1, this could be 278/356 (78%)*
*If schools who have not responded all report they do offer Computing Science experiences in S1, this could be 327/356 (91.9%)*

The S1/2 BGE content experience in S1/2 varies. However, most S1/2 courses reference content and skills that articulate with Computing Science qualifications. The most common being:

- Software develop through the use of Scratch / Python
- Physical computing with Microbit
- Computer Systems
- Web Development (HTML/CSS)
- Databases
- Cyber Security

There are many courses that include wider digital skills in the context of multimedia, including graphics and animation. S1/2 courses often include reference to functional digital skills. A word cloud based on free text responses regarding BGE content in Computing Science survey responses is shown below.



# Survey Results - National Qualifications

Of the 309 responses:

- 256 (82.7%) offer National 4 Computing Science
- 265 (85.7%) offer National 5 Computing Science
- 257 (83.1%) offer Higher Computing Science
- 118 (38.3%) offer Advanced Higher Computing Science

For context, in 2020, SQA reported that the number of local authority secondary schools nationally that presented National Qualifications in Computing Science at:

- National 5: 80.7%
- Higher: 71.4%
- Advanced Higher: 25.2%

The survey also asked schools if senior phase Computing courses were available via local college or local authority arrangements:

- 178/309 can access senior phase Computing courses via local college arrangements
- 170/309 can access senior phase Computing courses via local authority shared provision arrangements

# SQA NQ Presentations Over Time

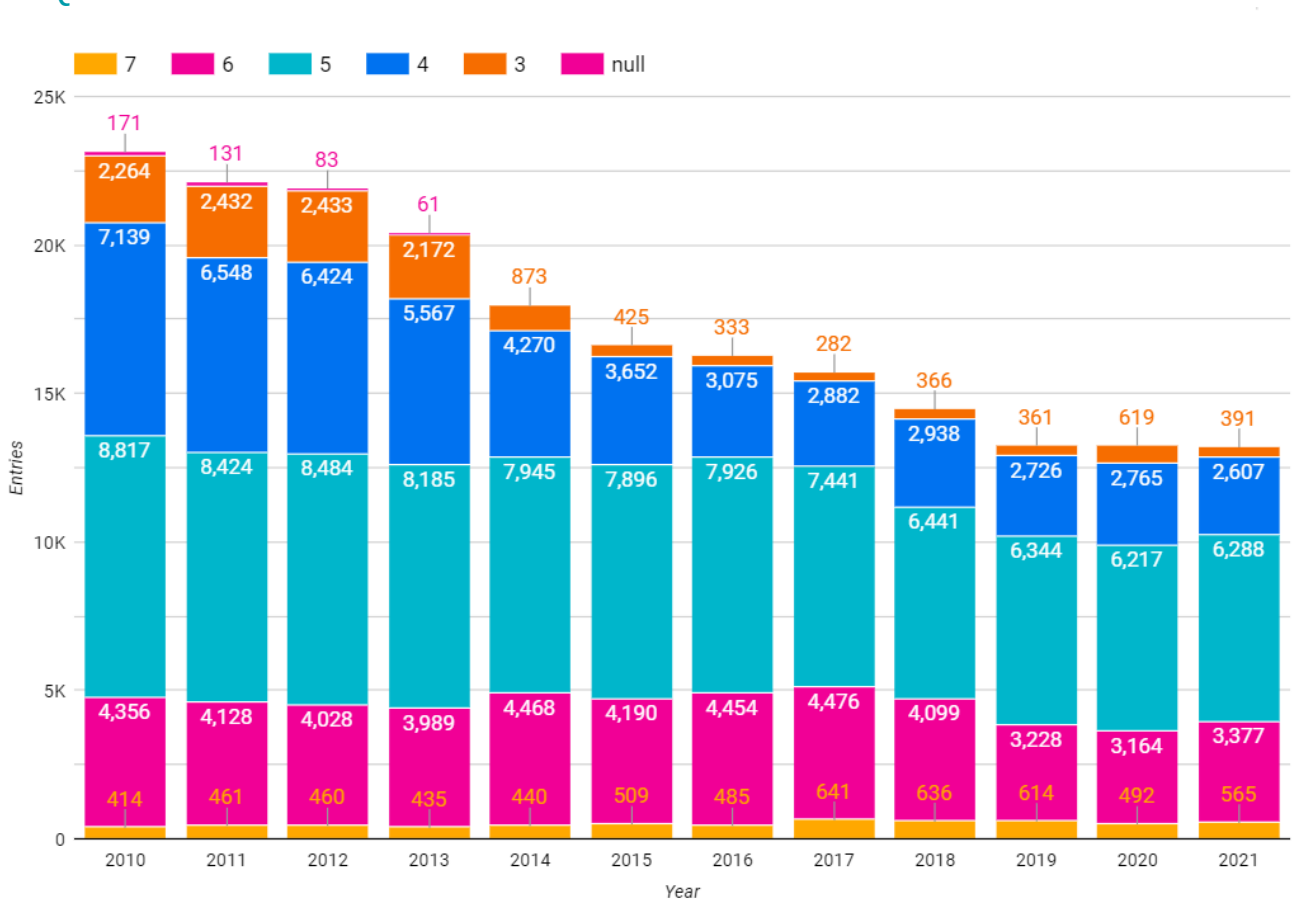
Since 2010, the cumulative number of learners presented for a national qualification in Computing Science (Standard Grade to Advanced Higher) has declined. From 23,161 in 2010 to 13,228 in 2021. A difference of 9,933.

Drilling down to SCQF level, a significant proportion of this difference stems from learners at SCQF levels 3 and 4 (foundation, general, Access 3, Int 1, N3, N4), contributing for 6,576 of this difference.

## Computing Science presentations

| SCQF Level | 2010 presentation | 2021 presentation | Difference |
|---|---|---|---|
| 3<br>(Foundation, Access 3, National 3) | 2435 | 391 | -2044 |
| 4<br>(General, Intermediate 1, National 4) | 7139 | 2607 | -4532 |
| 5<br>(Credit, Intermediate 2, National 5) | 8817 | 6288 | -2529 |
| 6<br>(Higher) | 4356 | 3377 | -979 |
| 7<br>(Advanced Higher) | 414 | 565 | +151 |

## Computing Science National Qualifications (and historical equivalent) only, by SCQF level



Changes to course content of pre National Qualification courses may be a factor in these figures, particularly at SCQF levels 3 and 4. Standard Grade and Higher Still courses at this level were significantly more focussed on application skills, whereas, National Qualifications are much more syntax/code focussed. See next section for further details.

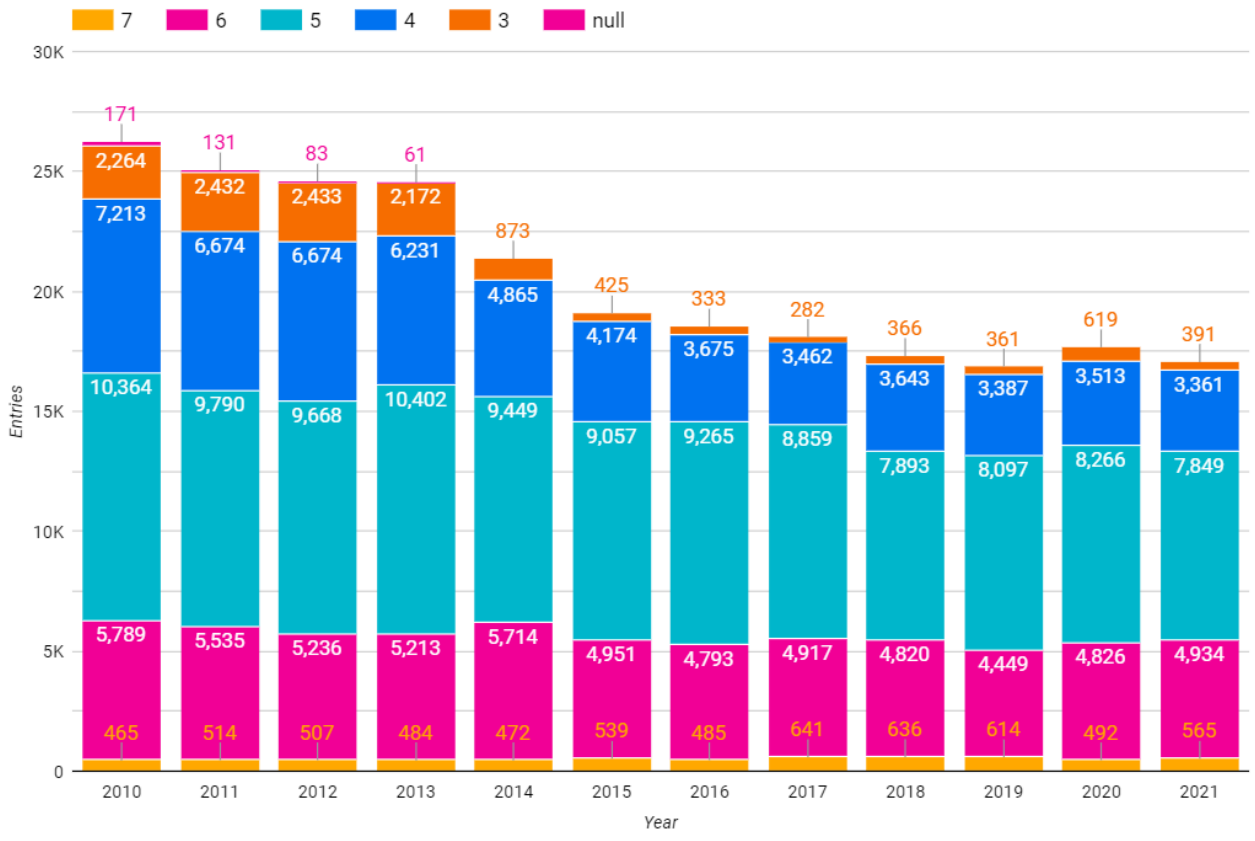
Computing Science (CS) NQ is not the only pathway available to our learners. Indeed, until the NQs were introduced, Computing departments could also (or only opt to) deliver Higher Still qualifications (Int2 – AH) in Information Systems (IS). There are also a number of NPAs that can be offered. Factoring in these qualifications over the same time period, a similar pattern can be seen.

## Computing Science, Information Systems and NPA presentations

| SCQF Level | 2010 presentation | 2021 presentation | Difference |
|---|---|---|---|
| 3<br>(Foundation and grade 7, Access 3, National 3) | 2435 | 391 | -2044 |
| 4<br>(General, Intermediate 1, National 4, NPA L4) | 7213 | 3361 | -3852 |
| 5<br>(Credit, Intermediate 2 (CS and IS), National 5, NPA L5) | 10364 | 7849 | -2515 |
| 6<br>(Higher (CS and IS), NPA L6) | 5789 | 4934 | -855 |
| 7<br>(Advanced Higher (CS and IS) | 465 | 565 | +100 |

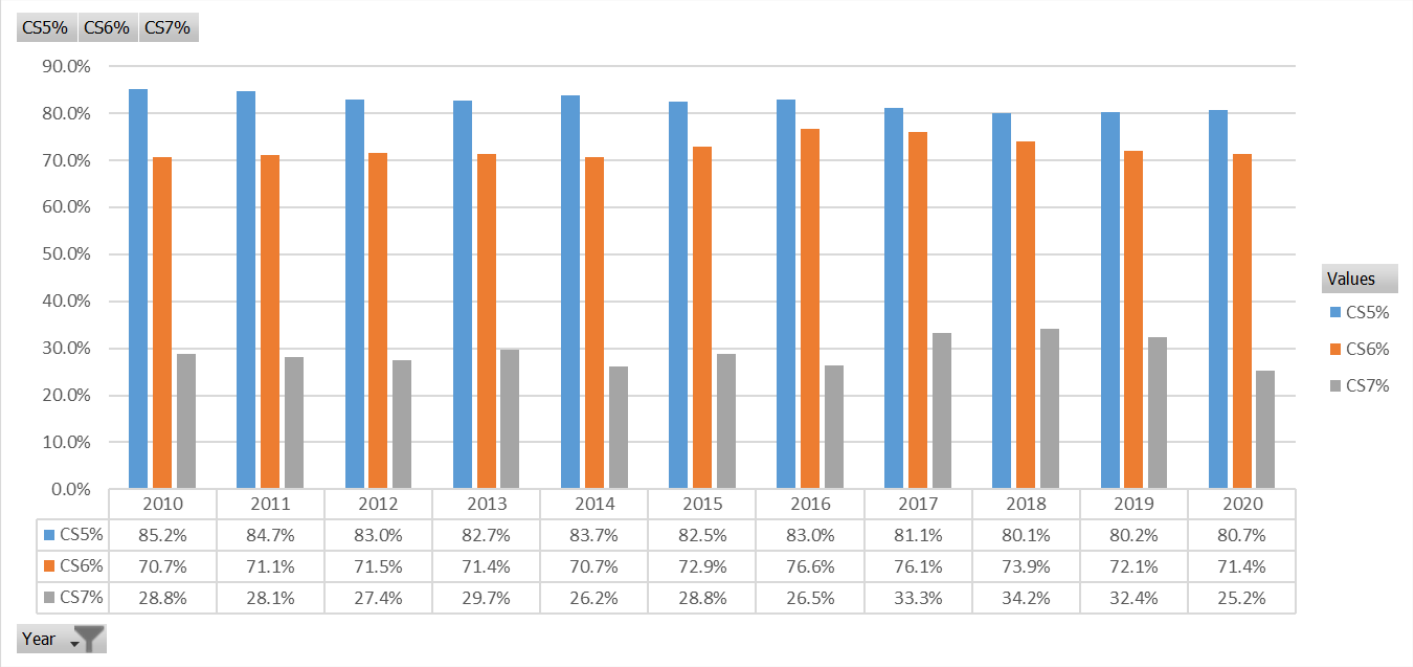
## Computing Science National Qualifications, Information Systems and Digital NPAs by SCQF level

*(null refers to grade 7 standard grade award)*



# Local Authority Secondary Schools Presenting National Qualifications in Computing Science over time

***Includes Standard Grade, Higher Still and National Qualifications in Computing Science only. Expressed in percentage of LA schools as number of schools in Scotland changes over time. Grouped by SCQF level.***




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CS5% | 85.2% | 84.7% | 83.0% | 82.7% | 83.7% | 82.5% | 83.0% | 81.1% | 80.1% | 80.2% | 80.7% |
| CS6% | 70.7% | 71.1% | 71.5% | 71.4% | 70.7% | 72.9% | 76.6% | 76.1% | 73.9% | 72.1% | 71.4% |
| CS7% | 28.8% | 28.1% | 27.4% | 29.7% | 26.2% | 28.8% | 26.5% | 33.3% | 34.2% | 32.4% | 25.2% |

# Computing Science National Qualifications Curriculum Content Offer Over Time

The course content of Computing Science qualifications over time has changed significantly. Particularly at SCQF levels 3 and 4. The historic courses at these levels did not have the same focus as current qualifications. Much of the content was applications and systems based. As the qualifications developed, much of this content was removed and replaced with software design and development and web development.

When the Higher Still course Information Systems was available, a number of schools opted for this as their S5/6 Level 6 offer as a progression from Standard Grade Computing. As a result of the discontinuation of Standard Grade and Information Systems, schools had to change their offer to the National Qualification Computing Science route. This may have had an effect on uptake. Information Systems as a course also had a higher uptake of female learners (average 30-34%) compared to Computing.

Summary of the content changes over time for different Computing Science courses at levels 4-6 can be seen in the following tables.

## SCQF Level 4

<table>
<tr><th>Standard Grade Computing Studies (General)</th><th>Intermediate 1 Computing Studies</th></tr>
<tr><td rowspan="2">Computer Applications (60 hours);<br>Computer Systems(20 hours);<br>Computer Programming(40 hours);<br>Project Work (30 hours);<br>Flexibility (10 hours)</td><td>Computer Application Software (40 hours);<br>Computer Systems (40 hours);<br>Optional Unit<br>[Software Development; Information Systems; The Internet] (40 hours)</td></tr>
<tr><td>2004 Update</td></tr>
<tr><td>2006 Update</td><td rowspan="2">Computer Applications (40 hours);<br>Multimedia Applications (40 hours);<br>Optional Unit<br>[Computers and the Internet; Information and the Internet] (40 hours)</td></tr>
<tr><td>Computer Applications (60 hours);<br>Computer Systems(20 hours);<br>Computer Programming(40 hours);<br>Project Work (30 hours);<br>Flexibility (10 hours)</td></tr>
<tr><th colspan="2">2014 National 4 Computing Science Course Specification</th></tr>
<tr><td colspan="2">Software Design and Development;<br>Information Systems Design and Development<br>Added Value Unit</td></tr>
</table>

## SCQF Level 5

| **Standard Grade Computing Studies (Credit)** | **Intermediate 2 Computing** | **Intermediate 2 Information Systems** |
|---|---|---|
| *1999 Arrangements* | | |
| Computer Applications (60 hours);<br>Computer Systems(20 hours);<br>Computer Programming(40 hours);<br>Project Work (30 hours);<br>Flexibility (10 hours) | Computer Systems - including applications (40 hours);<br>Software Development (40 hours);<br>Computing Project (40 hours); | Database Systems (40 hours);<br>Information Organisation (40 hours);<br>Optional Unit [Computer Application Software; Expert Systems; Hypermedia] (40 hours) |
| *2006 update* | | |
| Computer Applications (60 hours);<br>Computer Systems(20 hours);<br>Computer Programming(40 hours);<br>Project Work (30 hours);<br>Flexibility (10 hours) | Computer Systems (40 hours);<br>Software Development (40 hours);<br>Optional Unit [Artificial Intelligence; Computer Networking; Multimedia Technology] (40 hours) | Using Information (40 hours);<br>Database Systems (40 hours);<br>Optional Unit [Expert Systems; Applied Multimedia; The Internet] 40 hours) |
| *2013 END* | *2014 END* | |
| **2014 National 5 Computing Science Course Specification** | | |
| Software Design and Development;<br>Information Systems Design and Development | | |
| *2017 Update* | | |
| Software Design and Development;<br>Database Design and Development;<br>Web Design and Development;<br>Computer Systems | | |

## SCQF Level 6

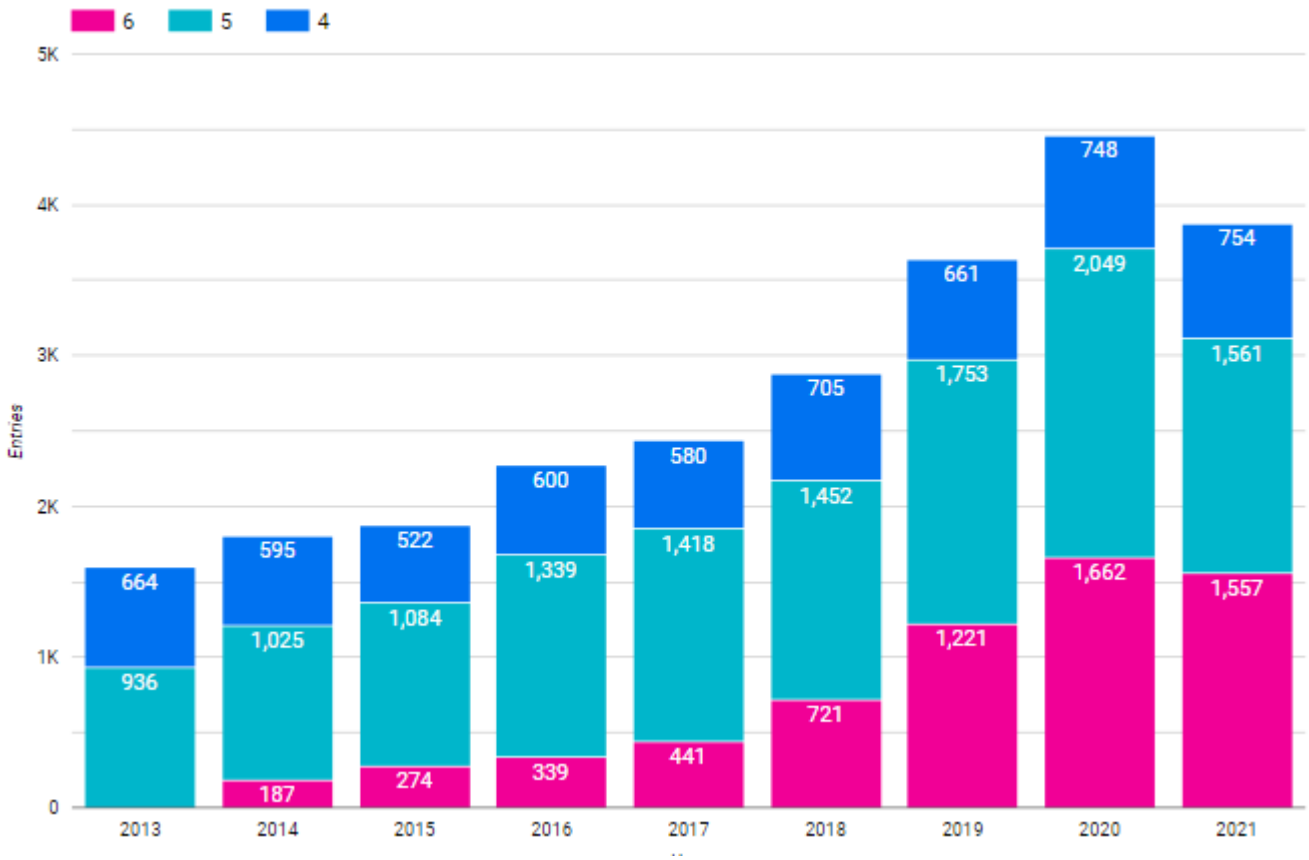
| **Higher Computing** | **Higher Information Systems** |
|---|---|
| Computer Systems (40 hours);<br>Software Development (40 hours);<br><br>Optional Unit<br>[Artificial Intelligence; Computer Programming; Computer Networking; Multimedia Technology] (40 hours) | Database Systems (40 hours);<br>Information Organisation (40 hours);<br><br>Optional Unit<br>[Computer Application Software; Expert Systems; Hypermedia] (40 hours) |
| *2006 Update* | |
| Computer Systems (40 hours);<br>Software Development (40 hours);<br><br>Optional Unit<br>[Artificial Intelligence; Computer Networking; Multimedia Technology] (40 hours) | Using Information (40 hours);<br>Relational Database Systems (40 hours);<br><br>Optional Unit<br>[Expert Systems; Applied Multimedia; The Internet] 40 hours) |
| *2014 END* | |
| **2014 Higher Computing Science Course Specification** | |
| Software Design and Development;<br>Information Systems Design and Development | |
| *2018 Update* | |
| Software Design and Development;<br>Database Design and Development;<br>Web Design and Development;<br>Computer Systems | |

# National Progression Awards / Other Senior Phase Offers

In 2012 SQA introduced National Progression Awards in the area of Computing and Digital. The current availability of NPAs offered by SQA include:

| | |
|---|---|
| Computer Games Development SCQF level 4,5 & 6 | Digital Media Editing SCQF level 5 |
| Computer Networks SCQF level 5 | Digital Media Production SCQF level 6 |
| Computer Refurbishment SCQF level 4 | Digital Passport SCQF level 4, 5, & 6 |
| Computers and Digital Photography SCQF level 5 | Mobile Technology SCQF level 4 & 5 |
| Cyber Security SCQF 4,5 & 6 | PC Passport SCQF Level 4,5 & 6 |
| Data Science at SCQF level 4,5 and 6 | Professional Computer Fundamentals SCQF level 6 |
| Digital Literacy SCQF level 3 | Social Software SCQF level 4 |
| Digital Media SCQF level 4, 5 & 6 | Software Development SCQF level 4 |
| Digital Media Basics SCQF level 4 | Software Development SCQF level 6 |
| Digital Media Animation SCQF level 5 | Web Design SCQF level 5 |

## Learner Uptake of Digital/Computing NPAs from Local Authority Secondary Schools over time by SCQF level



## Number of Local Authority Secondary schools presenting 1+ Computing/Digital NPA over time

| Year | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 |
|---|---|---|---|---|---|---|---|
| **Centres** | 76 | 99 | 112 | 123 | 142 | 163 | 181 |

## Specific National Progression Awards Provision asked in Survey

| | Number of Schools (%) | | |
|---|---|---|---|
| **Course/*Level*** | ***SCQF 4*** | ***SCQF 5*** | ***SCQF 6*** |
| Data Science | 6 (2%) | 10 (3.3%) | 5 (1.7%) |
| Cyber Security | 57 (19%) | 70 (23.3%) | 51 (17%) |
| Game Design | 112 (37.1%) | 122 (40.7%) | 91 (30.3%) |

## Other NPAs and Senior Phase Offers in Schools from Survey Responses

- Other NPAs including Software Design and Development, Web Design, PC Passport, Digital Passport and Digital Media
- Cyber Security fundamentals / Internet Safety
- Open University / YASS courses in Computing related disciplines
- Oracle Academy
- Foundation Apprenticeships
- Scottish Baccalaureate
- College NC/HNCs
- STEM leadership
- National 2 ICT

# Attainment/SIMD quintile profile of NQ Computing Science Courses (Insight)

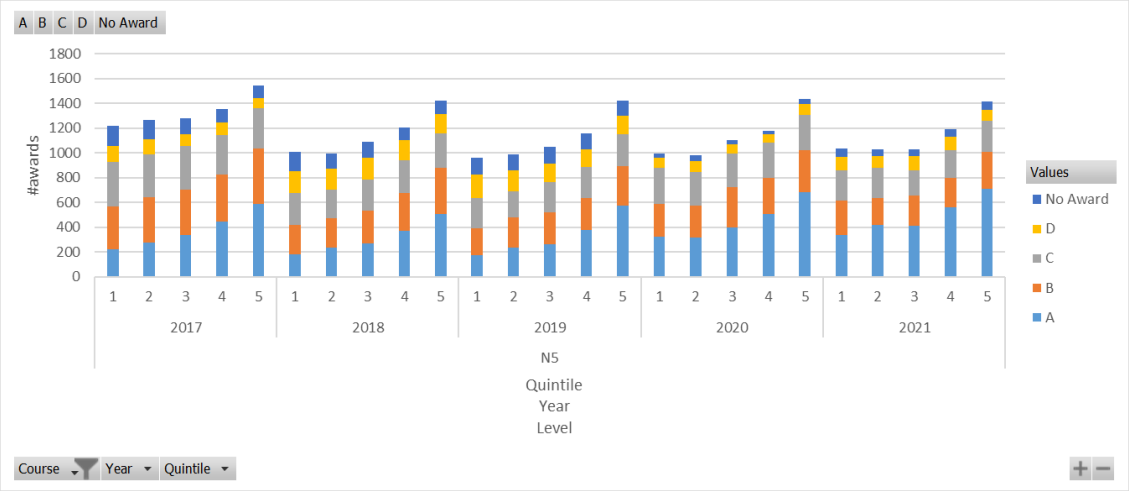
5 year trends in attainment and presentation of NQ Computing Science courses by SIMD quintiles.

Data from Insight over the past 5 years illustrates the uptake and attainment gap of learners taking Computing Science National Qualifications.

In the traditional examination years, 2017 – 2019, the data from insight indicates that gap between the most and least affluent was, in general, increasing. Particularly grade A/B at Higher and AH levels. In the years 2020 and 2021 where grades were based on teacher assessment / judgement, in general, show an improvement on previous trends.

The data also shows that more affluent learners chose to study Computing Science across the SCQF levels compared to less affluent learners.

## National 5 Computing Science

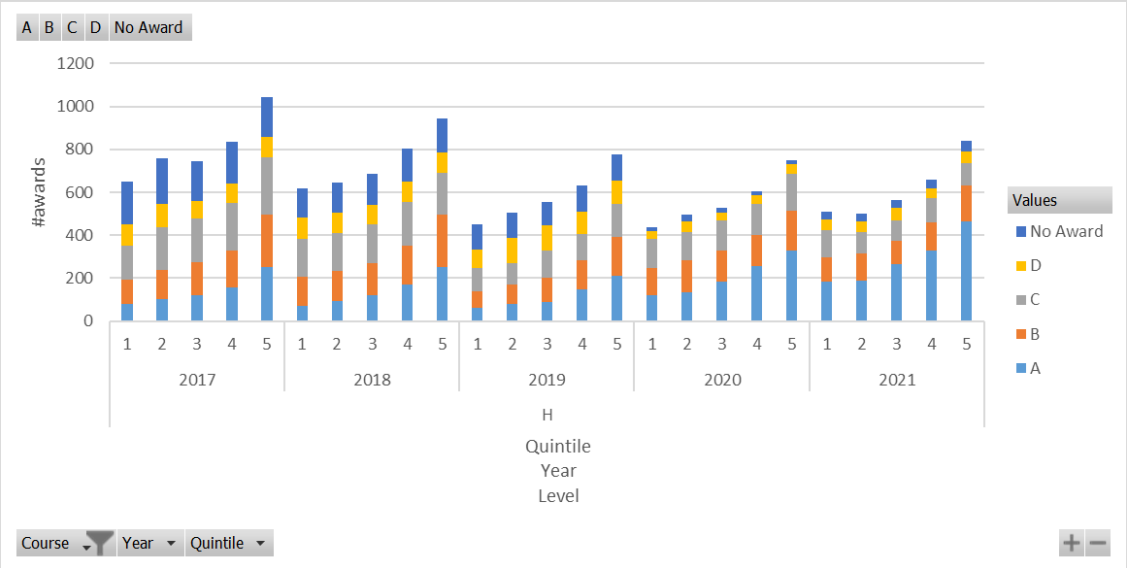



*Number of Quintile 5 learners achieving grades A-C comparted to Quintile 1 learners. National 5 Computing Science*

| *Year* / **Grade** | **A** | **B** | **C** |
|---|---|---|---|
| *2017* | 2.6 | 1.3 | 0.9 |
| *2018* | 2.8 | 1.6 | 1.1 |
| *2019* | 3.3 | 1.4 | 1.1 |
| *2020* | 2.1 | 1.3 | 1.0 |
| *2021* | 2.1 | 1.1 | 1.0 |

*Eg in 2018, for every 1 learner in quintile 1 who achieved an A grade, there were 2.8 learners from quintile 5*

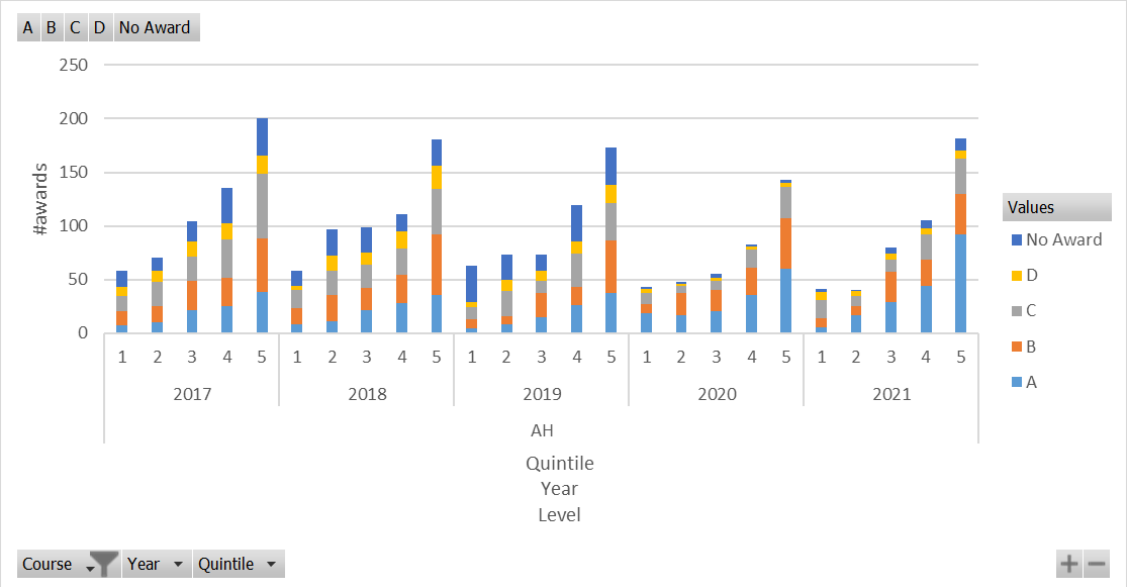
## Higher Computing Science




*Number of Quintile 5 learners achieving grades A-C comparted to Quintile 1 learners. Higher Computing Science*

| *Year* / **Grade** | **A** | **B** | **C** |
|---|---|---|---|
| *2017* | 3.1 | 2.2 | 1.7 |
| *2018* | 3.6 | 1.8 | 1.1 |
| *2019* | 3.5 | 2.4 | 1.4 |
| *2020* | 2.7 | 1.5 | 1.3 |
| *2021* | 2.5 | 1.5 | 0.8 |

## Advanced Higher Computing Science




*Number of Quintile 5 learners achieving grades A-C comparted to Quintile 1 learners. AH Computing Science*

| *Year* / **Grade** | **A** | **B** | **C** |
|---|---|---|---|
| *2017* | 5.4 | 3.8 | 4.4 |
| *2018* | 4.4 | 3.8 | 2.5 |
| *2019* | 9.3 | 5.4 | 3.2 |
| *2020* | 3.3 | 5.2 | 2.9 |
| *2021* | 18.4 | 4.2 | 1.9 |

# Recommendations

**Education Scotland Actions**

Share overview with local authority leads.

- Send local authority data to link person for verification purposes and for further completion from schools who have yet to respond.
- Update this report accordingly.

Learner Uptake in Senior Phase – current potential

- Gather further intelligence in relation to class sizes and make up of classes (eg single / bi level) in order to identify potential number of learners who could take a senior phase computing science course with current school provision

Identify target support groups and needs, including:

- schools where Computing Science is being delivered in the BGE but do not have a Computing Science teacher.
- identify single person Computing Science departments where the teacher is recently qualified.
- investigate how NELO / similar can be used/developed to support schools where Computing Science is not being delivered in the BGE, particularly schools with small pupil roles and remote/rural schools
- work with local authority/RICs to support the learning, teaching and assessment process in BGE Computing Science

**Further Recommendations**

Support further research the following areas:

- aAnalysis on the uptake and completion of Computer-Science-related National Qualification Group Awards (NQGAs) across the country to get a clear picture of which students are able to access these awards, how uptake and completion rates reflect demographic data such as gender and SIMD20 status,

- eExamine the socio-economic data in more detail, and specifically to explore how both uptake and completion of exam-level CS varies across local authorities. socio-economic categories, and whether any such variation is similar across different LAs, and designation of school ege.g. as rural and remote, and particularly whether these values differ between rural, remote and urban schools within an LA.

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