# A Flexible School and College Level Qualification in Data Science

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**Data Education** in Schools

The national schools and colleges data science qualification has been available for 4 years. 1,982 learners have completed the course to date across 30 educational institutions.

In 2018-9 the Scottish Qualification Authority (SQA) developed qualifications in data science aimed at school and college learners. These awards are **National Progression Awards** (NPAs) which are aimed at assessing a defined set of skills and knowledge in specialist vocational areas and can be offered by either schools or further education colleges.

The NPA in Data Science consists of two core units at every level: a core unit in Data Citizenship and a core unit in Data Science. At Level 5 and 6, learners must choose one optional unit from a selection. Each unit requires around 40 hours of learning time. Candidates for NPA qualifications demonstrate their knowledge and understanding through **continuous internal assessments**.

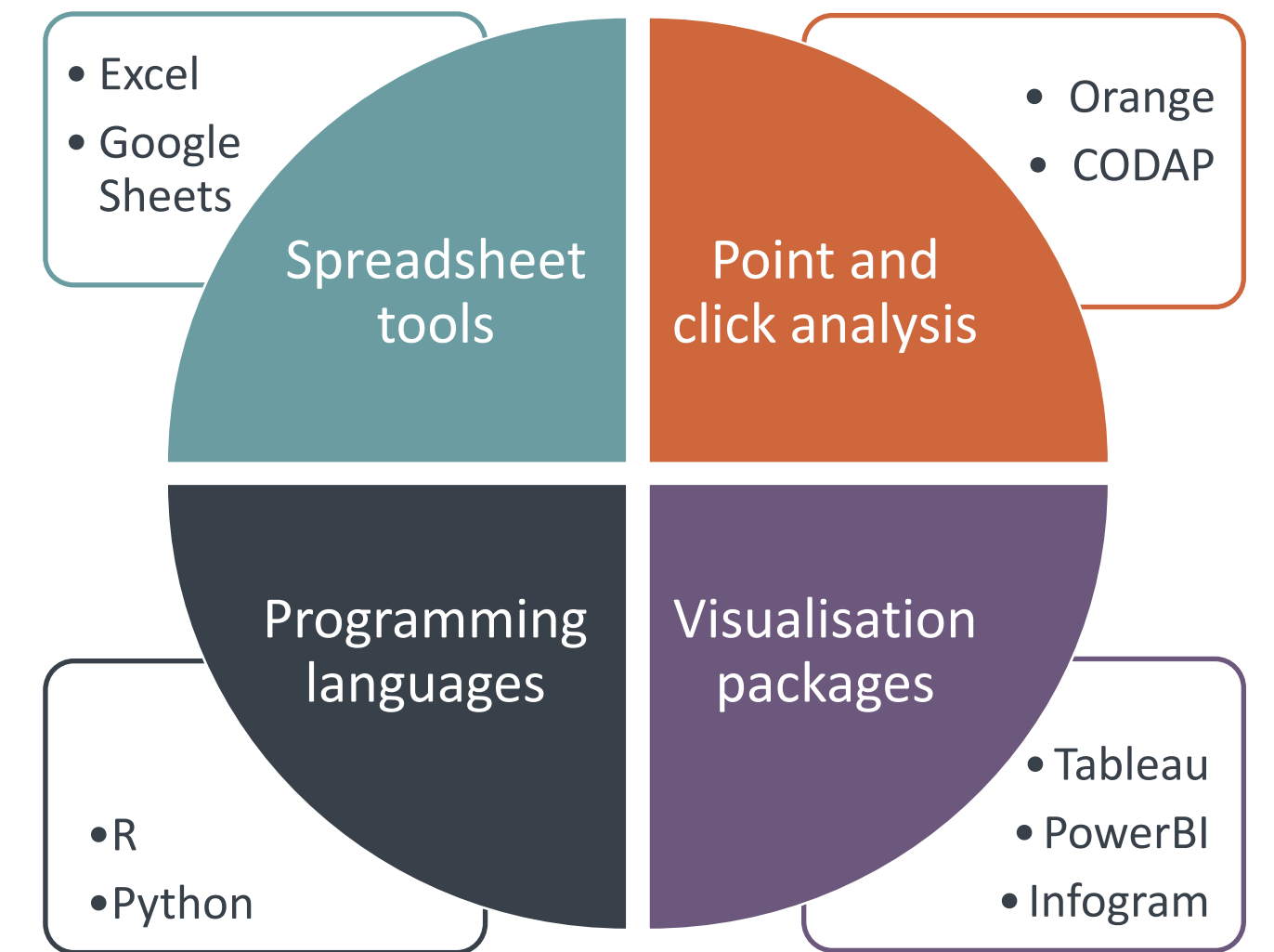## A new data science course being taught across different school subjects

> " Data Science will change how you see your subject "

**Maths** — **Geography** — **Computer Science** — **Modern Studies**

> " You can make all the fancy graphs you want to, but it has to be about using the data to make a difference to people's lives. "

### DESIGN PRINCIPLES
**Freedom to choose suitable software tools**

- Excel
- Google Sheets

Spreadsheet tools

Point and click analysis
- Orange
- CODAP

Programming languages
- R
- Python

Visualisation packages
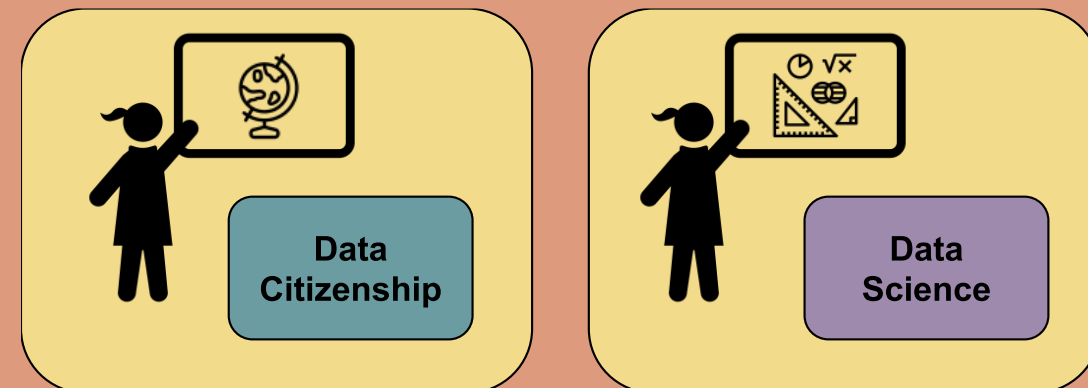- Tableau
- PowerBI
- Infogram

Learners should have a secure understanding of the underlying concepts involved in data science as opposed to getting training in using a particular software tool
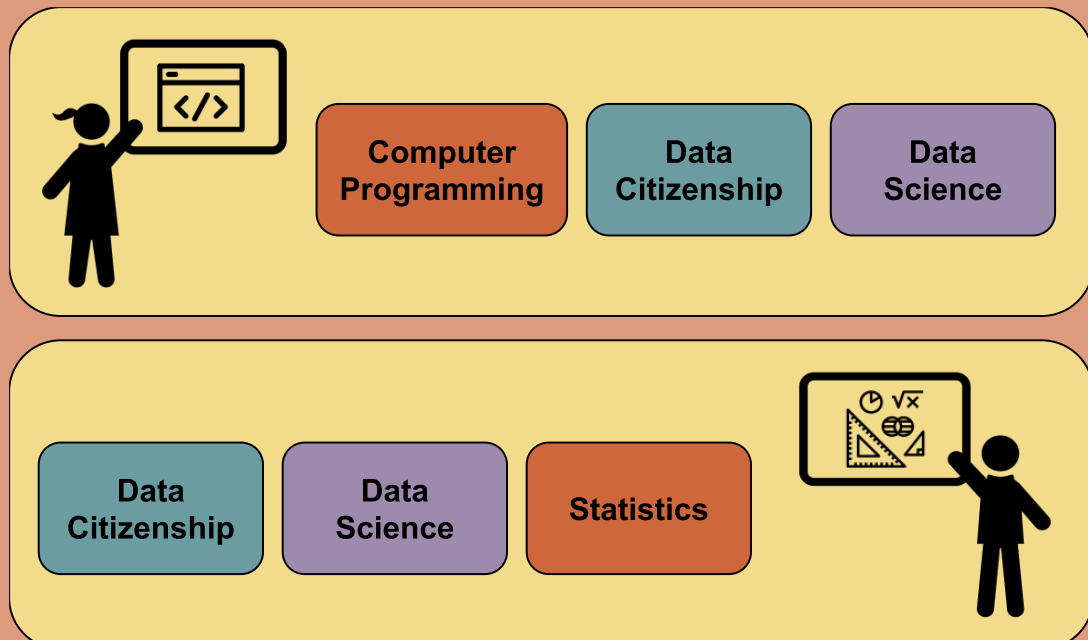
## DESIGN PRINCIPLES

### Interdisciplinary delivery and flexible options
The qualification was planned so that it could be delivered by teachers across a spectrum of subject areas. The NPA can be taught using the framework of data science but with a context of a specific subject area. This allows for more flexible timetabling based on staff availability, expertise, and interests.
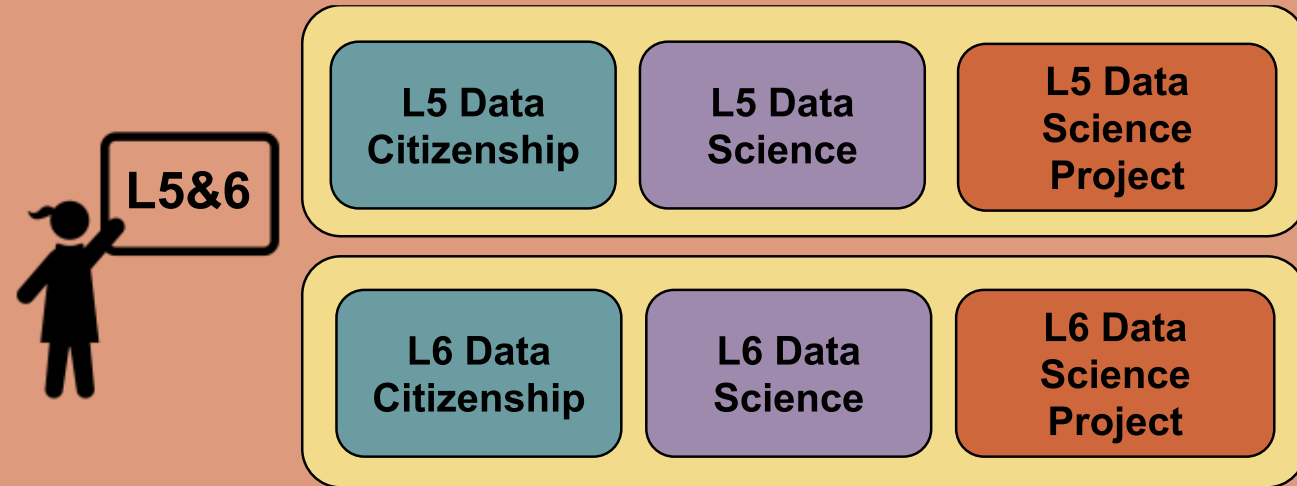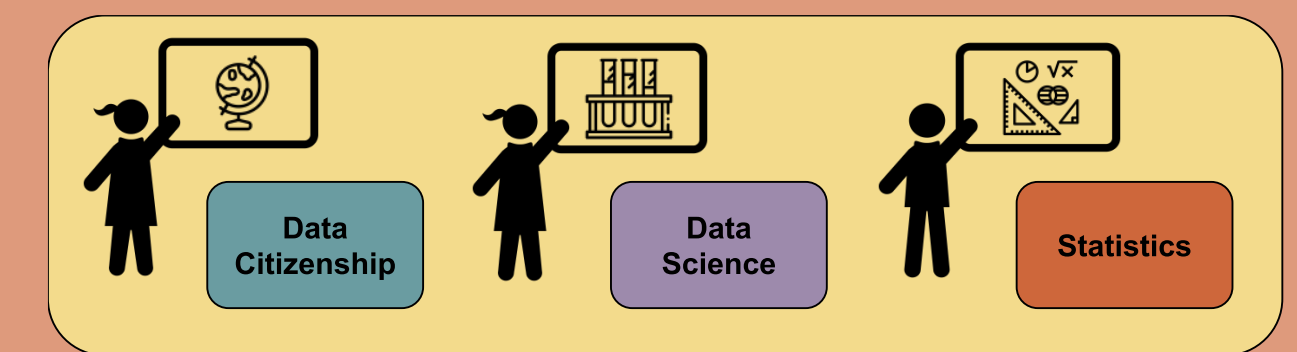
### Designed for multi-level delivery
L5&6

- L5 Data Citizenship
- L5 Data Science
- L5 Data Science Project
- L6 Data Citizenship
- L6 Data Science
- L6 Data Science Project

### Suitable for interdisciplinary delivery
- Data Citizenship
- Data Science
- Statistics

### Complementing other NPA courses
- Data Citizenship
- Data Science
- Data Security
- Digital Forensics
- Ethical Hacking

### Designed for standalone units
- Data Citizenship
- Data Science

### Flexibility course structure
- Computer Programming
- Data Citizenship
- Data Science

- Data Citizenship
- Data Science
- Statistics
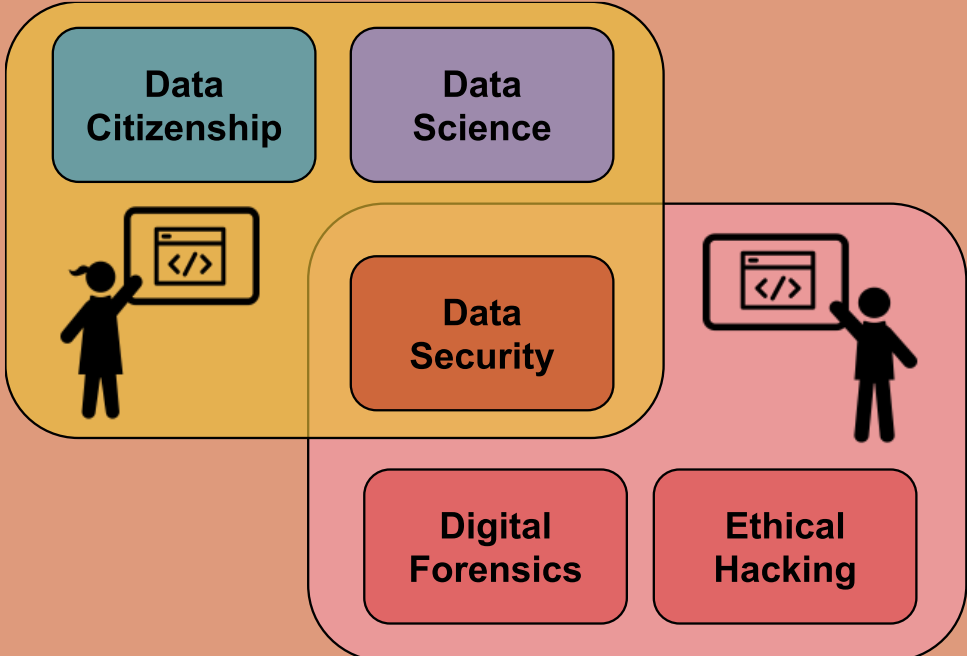
### More time for Level 4 learners
L4&5
- L4 Data Citizenship
- L4 Data Science
- L5 Data Citizenship
- L5 Data Science
- L5 Data Security
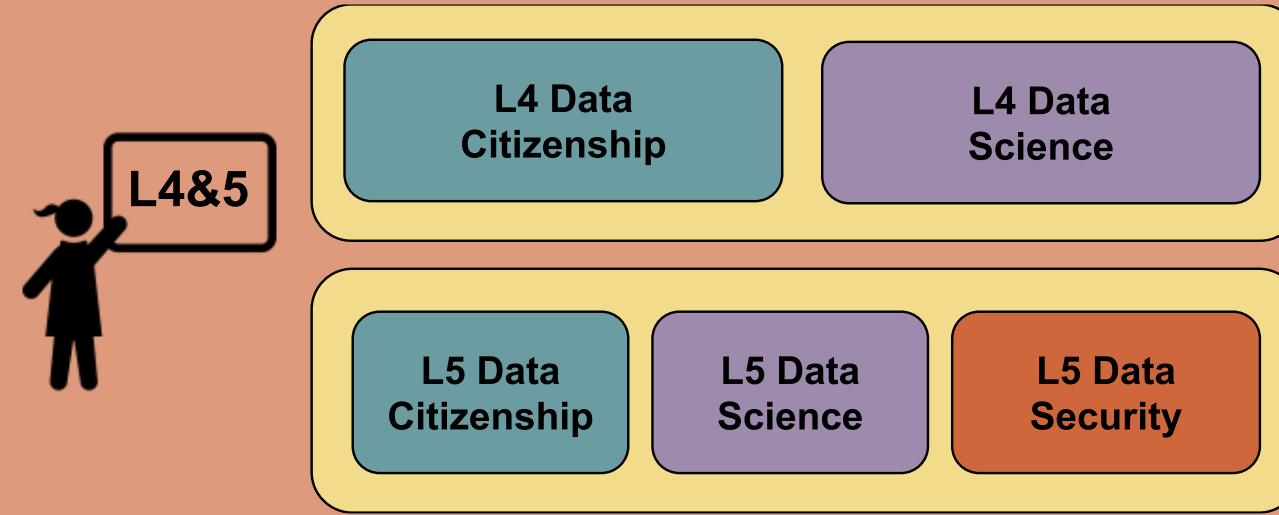
### Additional options for Level 4 learners
L4&5
- L4 Data Citizenship
- L5 Data Science
- L4 Data Security
- L5 Data Citizenship
- L5 Data Science
- L5 Data Security
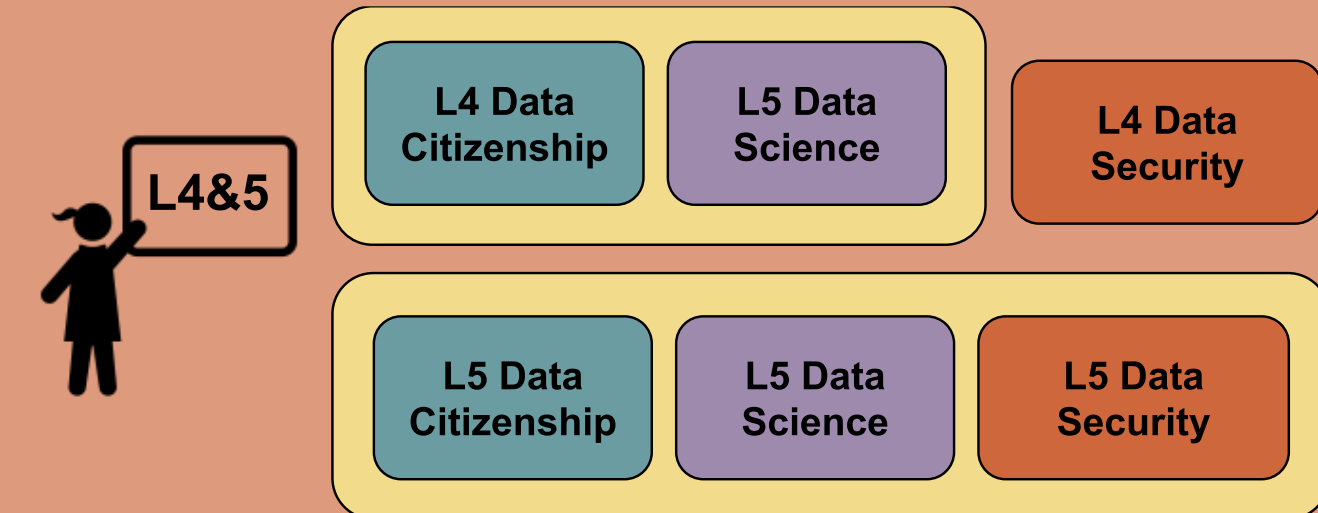
## QUALIFICATION STRUCTURE

**NPA Data Science Level 4**
- Data Citizenship Level 4
- Data Science Level 4

**NPA Data Science Level 5**
- Data Citizenship Level 5
- Data Science Level 5
- and one of: Data Security Level 5 / Computer Programming Level 5 / Machine Learning Level 5 / Data Science Project Level 5 / Data Science Statistics Level 5

**NPA Data Science Level 6**
- Data Citizenship Level 6
- Data Science Level 6
- and one of: Data Security Level 6 / Computer Programming Level 6 / Machine Learning Level 6 / Data Science Project Level 6 / Data Science Statistics Level 6 / Statistics Level 6

**Core Units** — **Optional Units**

## RECOMMENDATIONS

We recommend that a data science qualification for school learners should:
- be developed by a **team of subject specialists and teachers** with enough time for iterative piloting, learners' consultation and refinement;
- undergo **regular revision and refinement** to reflect the rapidly changing nature of the discipline;
- be **cross-disciplinary** to enable teachers from a range of subjects to offer it to their learners (not just computing teachers);
- contain not only technical content such as programming or statistics but should emphasise **real-world applications and societal implications**;
- contain **up-to-date and engaging topics** such as current news stories, examples of 'bad graphs', political themes, running surveys and creating graphs;
- provide **example datasets** which are cleaned and pitched at an appropriate level to avoid confusing or demoralising learners with complex datasets.
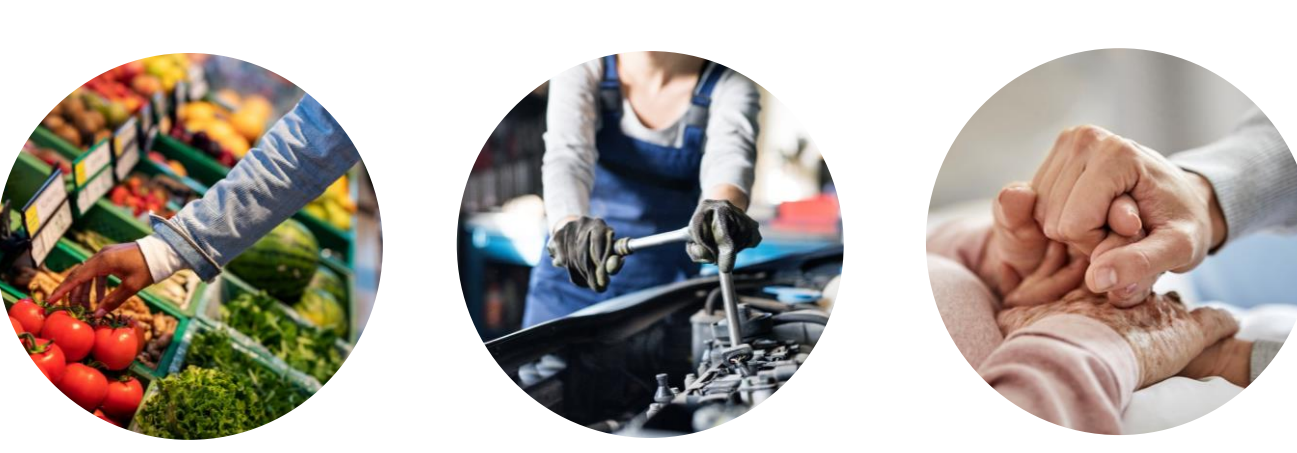
To **support teachers** in teaching the new qualification:
- Local or national education departments should provide **high-quality professional learning opportunities**. These could be supported by subject-specialist academics;
- Comprehensive, accessible **teachers' guides and other educational resources** should be available to help teachers during the initial steep learning curve.
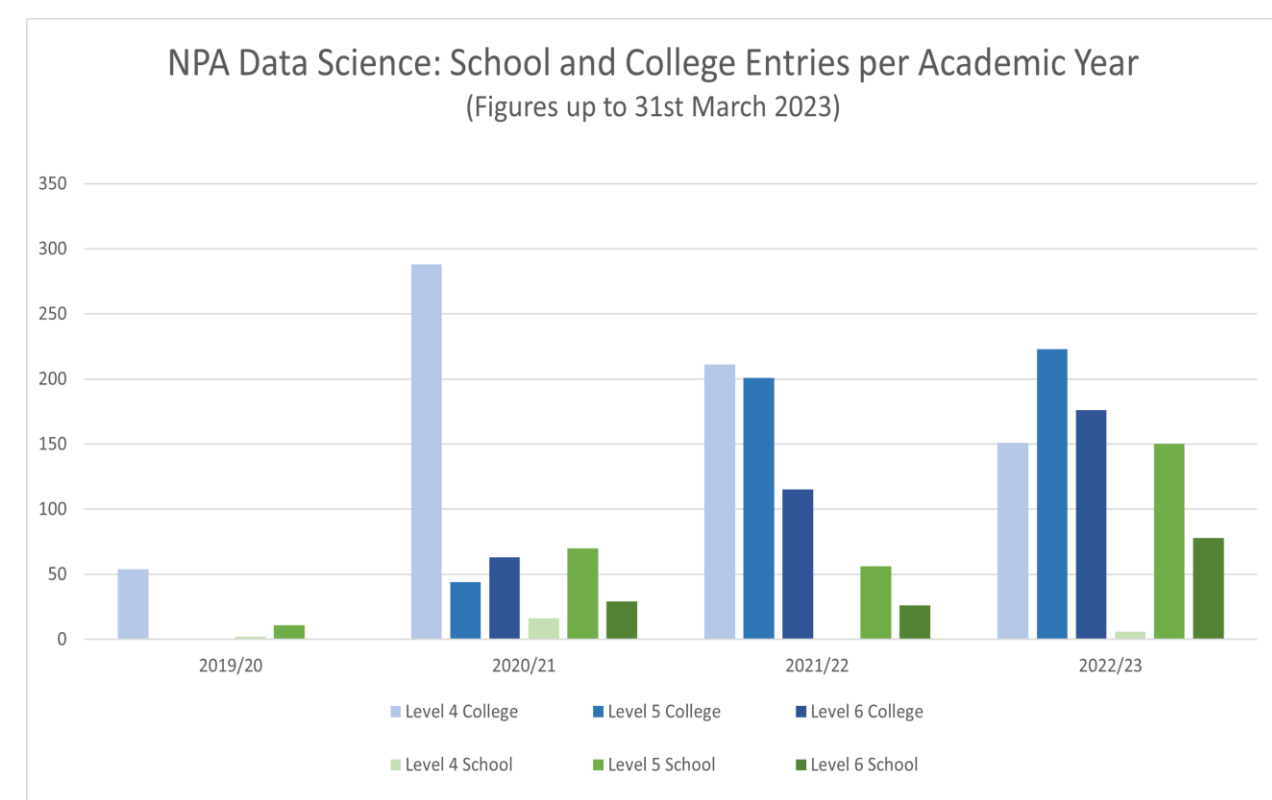
## A data science qualification being used for real world numeracy within different college courses

**Retail** — **Car mechanics** — **Health & Social Care**

NPA Data Science: School and College Entries per Academic Year
(Figures up to 31st March 2023)

NPA courses can be taught in schools or in colleges. Some colleges teach NPA to school learners in a Schools College Partnership.

> " Back at school, we would use data to make graphs and charts in subjects like biology, but it went no further. Now I'm using data in a real-life, practical way that can make a difference. "

> " The data science curriculum has been really well developed, with a lot of excellent resources and tools. "

> " Embrace the resources. I found them invaluable in preparation of classes. "

## UNIT OUTCOMES

### Data Citizenship

**Level 4**
DC4.1 State the use of data in society
DC4.2 Describe data literacy concepts
DC4.3 Interpret simple data

**Level 5**
DC5.1 Describe the use of data in society
DC5.2 Explain data literacy concepts
DC5.3 Interpret data

**Level 6**
DC6.1 Explain the use of data in society
DC6.2 Explain data literacy concepts
DC6.3 Interpret complex data

### Data Science

**Level 4**
DS4.1 Describe data science
DS4.2 Describe simple ways of analysing data
DS4.3 Analyse a small dataset to identify patterns

**Level 5**
DS5.1 Describe the tools and techniques of data science
DS5.2 Describe methods of routine data analysis
DS5.3 Analyse a dataset to identify patterns and trends

**Level 6**
DS6.1 Explain the principles of data science
DS6.2 Explain data science techniques
DS6.3 Analyse a dataset to make predictions

> " It's about using the data for good, not just looking at a spreadsheet of numbers. "

The outcomes and performance criteria are currently being reviewed and rewritten

**dataed.in/NPADS**

## RESOURCES

**NPA Data Science paper**
edarxiv.org/rn5ag

**Royal Society Report**
dataed.in/RSOU

**Data Science Lessons**
learn-data.science

**Educator resources**
teachdata.science

**Data Literacy resources for schools**
dataschools.education

**Data Education** in Schools