Offline Computational Thinking; an oxymoron or just surprisingly simple and effective?

Andrew Tidswell
Director of International Professional Development at Discovery Education

In our digitally connected world, it can be argued that Coding and especially Computational Thinking have become essential parts of a new 'Computing literacy' to run alongside traditional literacy and 'Digital literacy.'

It is obvious that these Computational Thinking skills can be developed by following Coding courses and developing apps using coding languages such as Scratch, Python or Discovery Education's own Coding service. However, the need for 'offline' Computational Thinking remains a vital part of building students' abilities to develop these problem-solving skills effectively and to apply them more broadly, both in learning and in life.

The 'Four Pillars of Computational Thinking' are one key aspect of this learning strategy and can be developed both online and offline. These pillars are defined as:

- **Decomposition** - breaking down a complex problem or system into smaller, more manageable parts
- **Pattern recognition** – looking for similarities among and within problems
- **Abstraction** – focusing on the important information only, ignoring irrelevant detail
- **Algorithms** - developing a step-by-step solution to the problem, or the rules to follow to solve the problem

For **Decomposition** children can explore some of the 'Fermi' problems I mentioned in my earlier piece on augmenting learning at home. These are problems that initially sound difficult to answer. bBut a reasonable solution can be reached if they are broken down into a series of related questions whose answers can be estimated. A famous example is: 'How many piano tuners are there in Chicago?',
Here are a few child friendly examples:

- How many words are there in the book you are currently reading?
- How many letters? How many times does the letter 'e' appear?
- How many grains of rice are there in a 1kg bag?
- How old would you be if you have lived for exactly 1 million seconds?
- If you had a stack of £2 coins which was as tall as you, how much money would you have? If you had your weight in 5p pieces, how much money would you have?

- If you wanted to fill an Olympic size swimming pool with milk, how many cows would you need?
- How many tennis balls would fit in a bathtub?

For a more active **Decomposition** experience, children can learn dance or exercise routines by breaking them into smaller constituent parts to make them easier to remember. They can even name the parts of the routine and then recombine them into different sequences to share with others.

Pattern Recognition can easily be supported offline by activities such as 'Image Sorts', where children are provided with a collection of pictures and asked to sort them into as many categories as they can, sharing these with other family members and trying to work out each other's categories. Simple games like 'Top Trumps', 'Happy Families' or any number of playing card games, from snap to bridge and all points in between, can develop this skill.

Abstraction lends itself easily to games of 'Pictionary', whereby children have to create simple drawings to convey a word or phrase to others. In order to be successful, they have to focus on the essential details of the word or phrase and include these in their drawings. This simple webtool allows you to generate lists of words to use at different levels of difficulty (as well as giving a brief overview of the rules.)

An **Algorithm** is simply a set of steps that need to be followed in order to solve a problem. These aren't limited to computing and can be represented in a variety of ways, for example: as lists, numbered diagrams, flow charts or storyboards. These can be developed at home by asking children to follow and then create recipes or to build models (for example with Lego) then develop the steps needed for someone else to build their model. They can present these in various ways – such as diagrams or flow charts. How about creating a storyboard for a favourite story or scene from a film?

There are plenty of other ways to develop these skills further, some of which are included in Discovery Education's free 'Offline coding activities' guide.

All of these skills do of course relate back to Coding and app development. Schools who subscribe to Discovery Education's Coding can easily share this resource with their families at home. This will enable them to build and develop apps by following the lessons it provides or by experimenting in the 'Create' area. Discovery Education Coding is 'structured to enable creativity' meaning that children as young as 5 can build authentic apps. They do this by following carefully designed steps to acquire new skills, before then applying them to create their own apps.
Further information on Discovery Education Coding

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