Decomposition

What is decomposition?

Decomposition is breaking a problem or system down into its parts. Sometimes we break those parts down further. We do this to solve complex problems or understand complex systems.

Why is Decomposition Important?

As we decompose something we learn more about it. If we decompose a problem it becomes more manageable as we can deal with the parts separately and more easily.

Two people could make this breakfast at the same time, one could make tea and one could make toast.

Decomposition is particularly important if we are trying to understand things that are complex. Solutions created using decomposition can be easier to understand, test, maintain and change.
What does decomposition look like in the primary curriculum?

Decomposition is everywhere in Primary practice. We are always asking pupils to find out more, tell us more.

Whenever pupils are labelling, adding detail to concept maps, or creating instructions, life cycles, and timelines they are breaking something down, and thinking about detail, and so developing their decomposition skills.

If pupils undertake any kind of project or task, such as: putting on a school play, organising a cake sale, creating a news report, working out how to solve a maths problem, making a sandwich or getting dressed for PE, they will need to break the task up into manageable tasks or parts. That is decomposition.

In primary settings, as pupils learn to decompose, they might create only a partial decomposition. That is, they might not include all aspects or parts of a topic, but only the things they currently know about. As they progress they should check that they create a complete decomposition and do not miss any part of the whole. Also, as they progress, they can further decompose each part into sub-parts and so on.

If making a computer game, a pupil might decompose the game into: plot, characters and setting. They might then further decompose the characters into actions and appearance. The setting might be decomposed into obstacles, scoring objects and background. In developing a robotic toy, pupils would need to consider the hardware components, both individually and as a system, the algorithms they’ll need to control their toy and how to write those as code. In general, technology = hardware + algorithms + code.
EYFS
In Early Years, practitioners often create opportunities for exploring detail. In a shop role play, pupils think how to set up their shop and how to sell things, they think about all the things they need such as things to sell, price tags, a till, money for change. When making models, say an aeroplane, pupils will make the wings, add these to the body of the plane and then add the wheels: the children have thought about the parts and then put them together.

Teachers model these skills and can take it a step further by showing how to check that they have all the things needed. Checking is evaluating, another computational thinking concept.

KS1
Pupils continue to use role play to explore these concepts. Written forms of decomposition become more common, for example they label the parts of a flower in science, they add detail to a concept map when they find out more about a place in geography. Progression is similar to Early Years as pupils become more independent in exploring detail.

Teachers can model how to take this further by checking they have not missed a part (evaluation) and encouraging pupils to share their understanding with others (collaboration).

KS2
Solve problems by decomposing them into smaller parts.
Pupils explore subjects in more detail, decomposing to an increasing number of levels. They check that they have not missed any parts as they add further detail. By the end of KS2 they should start to instigate the use of decomposition independently to help them reveal detail and add precision.

Teachers create project based learning opportunities that require pupils to apply their decomposition skills with more complex problems. For example, if putting on a school play they might break the organisation of the play into advertising, set, script, production, tickets, performance. Within each part they might assign roles and further break down to tasks that they then tick off, checking that they have not missed any crucial areas as they tease out the detail.

In computing, teachers might model breaking down programs as a key approach to debugging. Showing pupils how to break their program down into parts, then thinking what each part should do, testing if it does as expected, to find where the bug is so that it can be fixed.

Activity coming soon!
Find out more about decomposition

More information on decomposition with further detail and examples.
Thinking myself – decompose
Google Computational Thinking Decomposition
Decomposition, Computational Thinking In Primary Schools, Miles Berry, 2014
Literacy -planning writing.
Science - adding detail to concept maps.

Gallery of samples of children’s work showing decomposition

Simple labelling in early years.

Sequencing in early years.

KS1 sequencing in science

Mind mapping in KS1 to show what I know
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Learning more by looking at stages in KS2.

Decomposing to a further level in upper KS2/ KS3.