

# Decomposition

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## Decomposition Activities for the PK-3 Learner

Decomposition involves breaking something down into its parts, to "see what it is made of," whether physically made of, or the steps which make up the process. This age group learns by doing, so the practical activities outlined here allow for practicing decomposition while completing sequential and familiar tasks.



Following the steps leads to sweet success at the end of the project!

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## Examples of Decomposition Activities (ATP.VDR.K.A). ATP.PD.K.a ATP.VDR.1.a

- Going to the bathroom, making lunch, etc
- Making cookies start to finish
- Building a lego fort
- Asking, "what are the parts that make .... and how can these be made into something new?"
- "Debugging" with a friend to find mistakes when something doesn't work the first time around
- Complete the pattern in a printed series of shapes, symbols, or pictures

## Decomposition

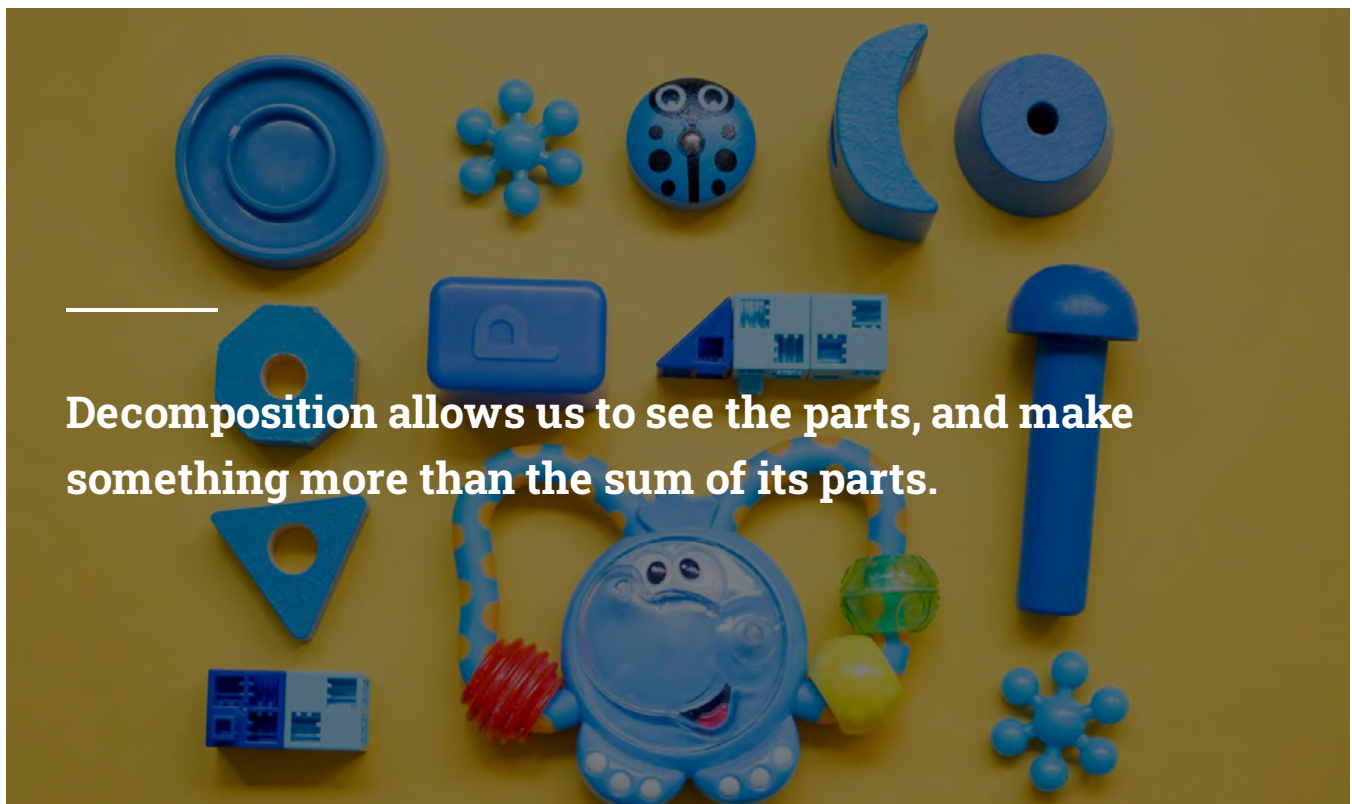
Have you ever cooked fried rice? Do you just add in all the ingredients at the same time? How do you break down the steps? Learn how to break down a complex issue into smaller manageable steps in order to solve it.

Computational Thinking 101: a bowl of fried rice-  
external link-YouTube

## Computational Thinking 101: Ep 3 Decomposition - A Bowl of Fried Rice

Have you ever cooked fried rice? Do you just add in all the ingredients at the same time? How do you break down the steps? Learn how to break down a complex...

**VIEW ON YOUTUBE >**



### Another Look at Decomposition

The following video breaks down, in PK-3 friendly terms, how decomposition can be applied for even the youngest learners. Later videos in this series are linked below to continue your journey.

# Doodle: Introduction to Decomposition breaking down complex manequin- external link

## **Additional Video Links**

- [Decomposing Big Numbers](#)
- [Applying Decomposition to Make Hobbies More Enjoyable](#)

# Pattern Recognition

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## Pattern Recognition

Pattern recognition includes the ideas of problem-solving, sequencing, inference, and modeling for the PK-3 age group. Problems at this age include age-appropriate scenario-based situations where the learner can image themselves in a familiar situation and apply knowledge for future interactions.



For the pre-reader, hands-on activities offer the chance to problem solve in a tangible way.

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- **Problem-solving** (CS.HS.K.a) , ATP.PD.K.a, ATP.CS.1.a W
  - Examples of age-appropriate problems to solve:
    - We have 2 calculators and 5 children who need to use one, what can we do? Examine other people's feelings and viewpoints about potential solutions, looking at the problem from multiple angles.
    - Identify the emotion of the subject based on their face. How can we encourage more positive emotions and reactions when confronted with a problem?
    - Teaching students to identify what the problem could be and a possible solution to the problem when given a contextual situation.

## **Pattern Recognition: Sequencing and Order**

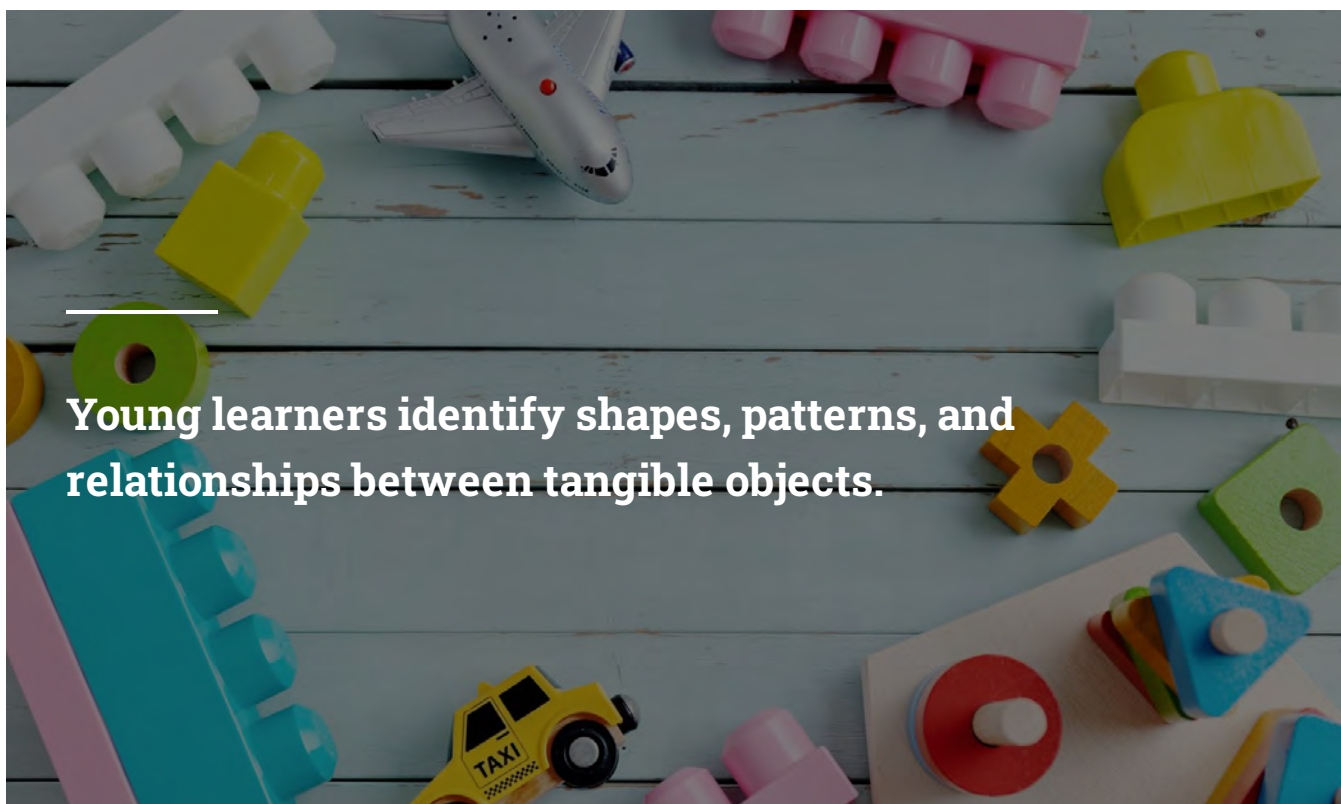
Have you thought about what you do every day? Is it the same every day? How would you program a robot to brush your teeth? Learn about sequencing and order through everyday routines in a relatable way.

## Computational Thinking 101: Sequencing and Order-external link

## Computational Thinking 101 Ep 1: Sequencing and Order

Have you thought about what you do every day? Is it the same every day? How will you programme a robot to brush your teeth? Learn about sequencing and order ...

**VIEW ON YOUTUBE >**



**Young learners identify shapes, patterns, and relationships between tangible objects.**

### Teaching Pattern Recognition

Child-centric video with parental and teacher resources for applying skills in the classroom and in the home.

Teaching Pattern Recognition-Learn Computational Thinking-external link-YouTube



# Abstraction

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## Abstraction can be practiced by hands-on activities, by viewing videos - or both!

The PK-3 student experience is about experiencing abstraction rather than the terminology behind it, whether feeling, touching, and categorizing objects, or watching someone else do it, this student will gain knowledge by doing, especially the pre-reader who can listen and apply but not read and review.





Categorizing beads by color is a simple, yet effective, abstraction activity for the young learner.

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## Hands-On Abstraction Activities

(ATP.VDR.K.A) ATP.PD.K.a DA.IM.1.a

- Identify the differences between table & chair, fruits & veggies, insects vs arachnids
- Drawing a potato head or a crazy imaginary friend
- Categorizing simple objects as same vs different
- In a group of objects, decide what things belong and which should be excluded?

## Abstraction and Generalization

Let's look at details. In what ways, are a chair and a table similar? How are they different? How do we tell them apart? Learn the concept of abstraction and generalization through a comparison of various objects to identify the unique features of different groups of objects.

# Computational Thinking 101: Abstraction & Generalization-external link-YouTube



Categorizing fruits and vegetables by type, color, size are just a few ways to use abstraction with everyday objects.

## **Two-part video featuring Abstraction Principles**

**Using abstraction and pattern recognition to simplify things by finding similarities.**

Introduction to Abstraction-external link  
YouTube

## **Abstraction through different breeds of Dogs and Cats, Predators and Prey**

### **Introduction to Abstraction-Part II external link-YouTube**

The key in abstraction is not only deciding what's important in regards to the situation/problem/design, but also deciding what is unimportant. Even though the steps are simpler and age-appropriate, the PK-3 learner is able to begin categorizing objects and apply the principle of Abstraction.

# Algorithm Construction

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## Algorithmic Thinking

While it sounds complicated, algorithmic thinking for the PK-3 learner involves sequencing, loops, and builds on pattern recognition, sequencing, decomposition and abstraction to create an algorithm.



Sorting animals creates an algorithm using pattern recognition

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Sequencing tasks can include sorting by color, height, or selection.

(DA.DCS.K.a, DA.DCS.K.b) (ATP.VDR.K.A), ATP.PD.K.a, DA.DCS.1.a , ATP.CS.1.a W

Loops include following daily classroom routines, sorting objects at home or school, or working with an adult to create the sorting criteria.

(ATP.CS.K.a, ATP.PD.K.a)

Asking the learner: Which one of these does not belong in a set, or how would you sort these pictures of...animals, food, etc.?

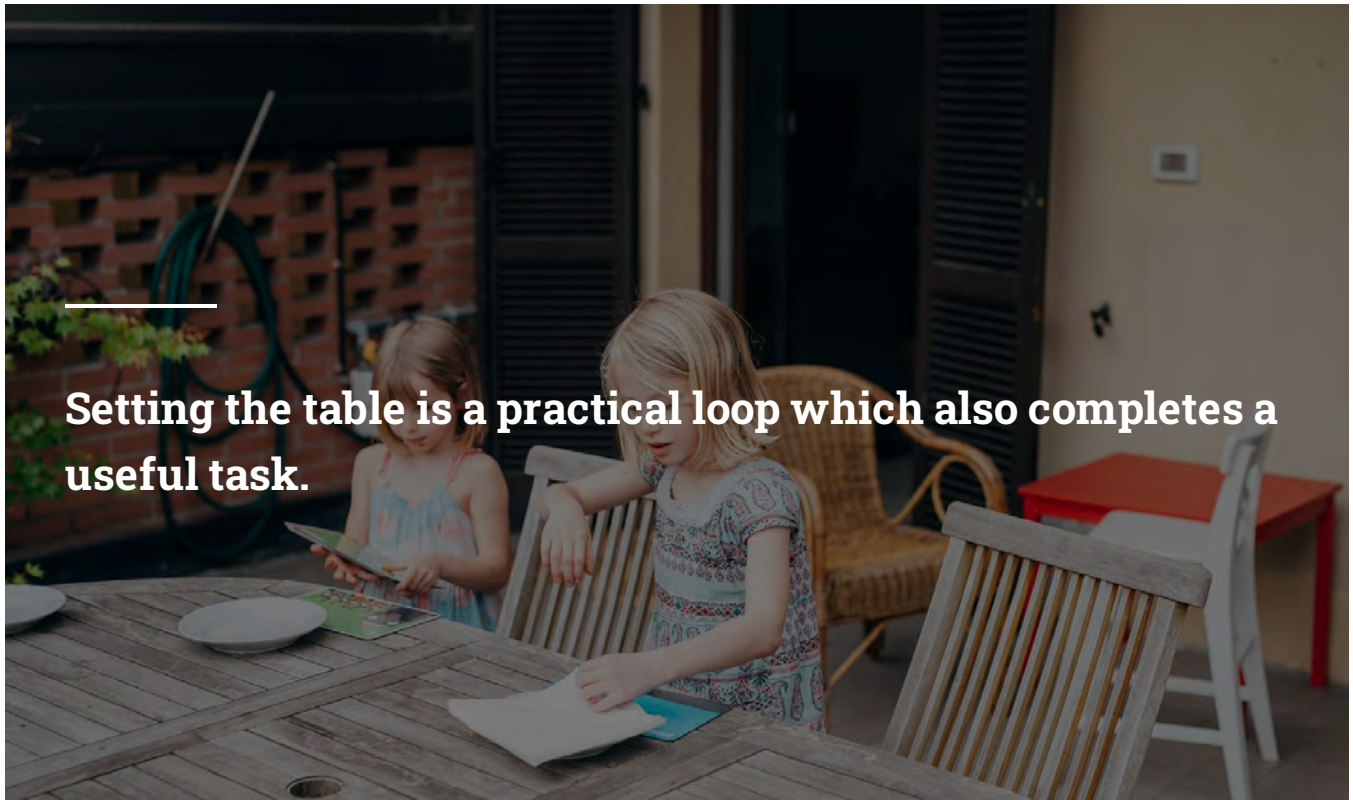
## **Computational Thinking via Looping**

What are the steps to make a tray of fruit jellies? How many times do you need to repeat the actions? Learn what is a repeat function/loop through steps to eating, making fruit jellies and other daily experiences.

Computational Thinking 101: Loops:  
Making Fruit Jellies  
external link-YouTube

What are the steps to make a tray of fruit jellies? How many times do you need to repeat the actions? Learn what is a repeat function/loop through steps to e...

**VIEW ON YOUTUBE >**



**Setting the table is a practical loop which also completes a useful task.**

## **Learning Algorithmic Thinking**

Age-appropriate introduction to the concept of algorithmic thinking, with plenty of ideas for hands-on application of concepts.

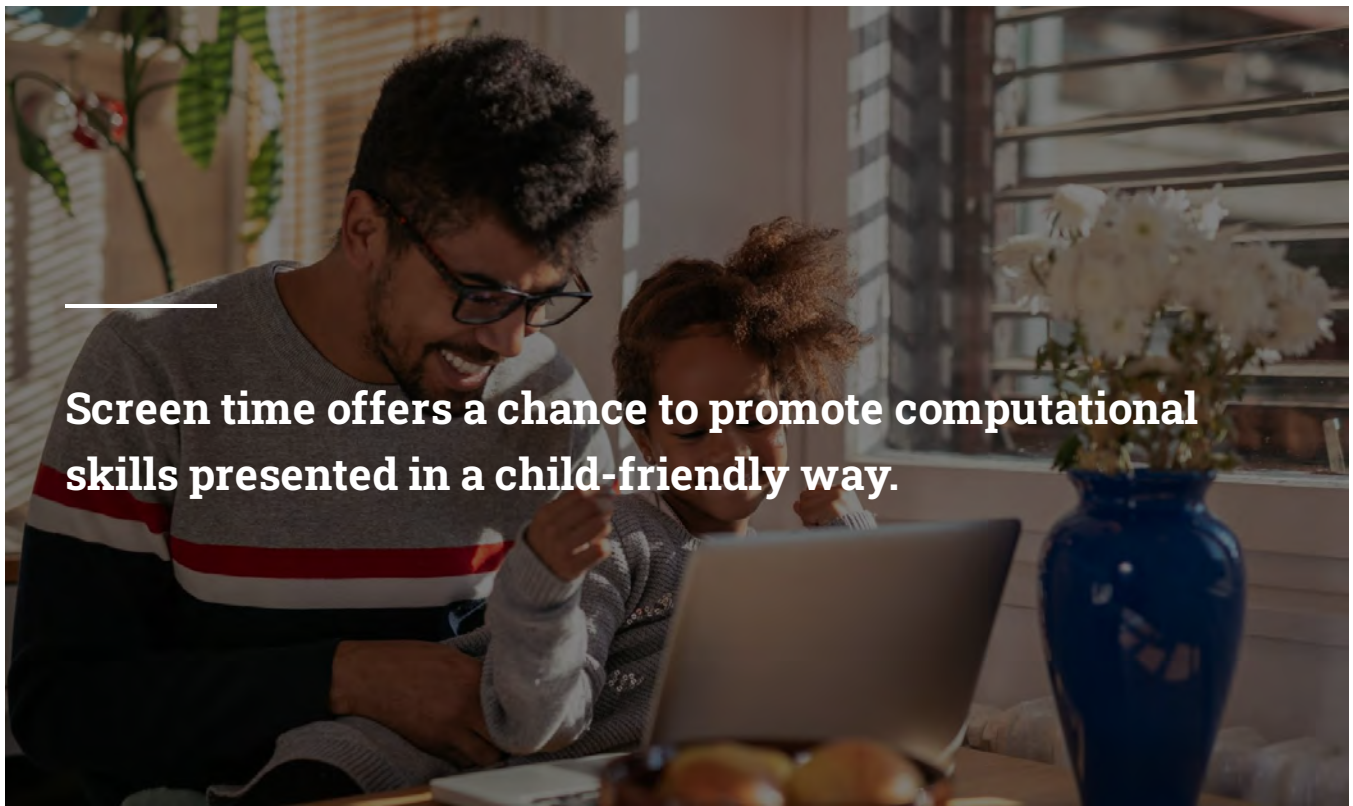
**Jules Episode: Intro to Sof App-Learning  
Computational Thinking**

## PK-3 Resources

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### Resources


The following links are categorized as videos or journal articles and can be used for lesson planning or to promote further research.





## Video Resources

- [Scratch Activity Guides](#)
- [Digital Technologies Hub](#)
- [CODE.org](#)
- [Learn About Computer Science without a Computer!](#)



Unplugged activities offer a way to integrate problem-solving skills and computational thinking skills for the PK-3 learner.

## Journal Articles

- del Olmo-Muñoz, J., Cózar-Gutiérrez, R., & González-Calero, J. A. (2020). Computational thinking through unplugged activities in early years of Primary Education. *Computers & Education*, 150, 103832. <https://doi.org/10.1016/j.compedu.2020.103832>.
- Chaurasia, R. (2019, August 18). Teaching kids algorithmic thinking through games. A4Algo. <https://medium.com/a4algo/teaching-kids-algorithmic-thinking-through-games-42ffdade6142>
- Mezak, J., Papak, P. P., & Vujčić, L. (2021). The integration of algorithmic thinking into preschool education. *EDULEARN21 Proceedings*, 8182–8187. <https://library.iated.org/view/MEZAK2021INT>