BIG IDEAS

computational concepts, computational practices, and learning approaches

Computational thinking is a set of concepts and practices that draw on ideas from the world of computing. There has been a growing recognition of the importance of computational thinking for understanding and solving problems in a wide range of contexts, not only in the field of computer science. Programming can serve as an important context for the cultivation of computational thinking. In this workshop, we take an explicitly design-based learning approach to understanding computational thinking concepts and practices through programming.

COMPUTATIONAL CONCEPTS

Here are a few of the computational concepts that we will be exploring during the workshop:

sequence
identifying a series of steps for a task

loops
running the same sequence multiple times

parallelism
making things happen at the same time

events
one thing causing another thing to happen

conditionals
making decisions based on conditions

operators
support for mathematical and logical expressions

variables
storing, retrieving, and updating data

lists
a structure for organizing a collection of items

COMPUTATIONAL PRACTICES

The process of putting these computational concepts into action is supported by particular computational practices. These problem-solving practices include:

incremental/iterative
developing a little bit, then trying it out, then developing some more

testing/debugging
making sure that things work – and finding and fixing mistakes

reuse/remix
making something by building on what others – or you – have done

abstraction/modularization
building something large by putting together collections of smaller parts

LEARNING APPROACHES

What are particularly effective ways of exploring computational concepts and practices? Learners should have opportunities to engage in experiences based on:

design
creating things, not just using or interacting with things

interests
creating things that are personally meaningful and relevant

collaboration
working with others on creations

reflection
reviewing and rethinking one's creative practices