COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE

3RD CONFERENCE FOR TEACHERS 2011

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Algorithms + Data Structures = Programs

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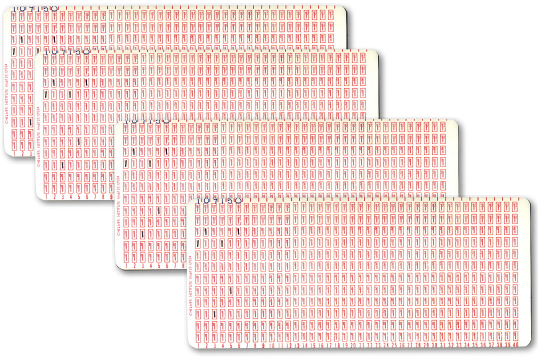

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What research?

There **is little research to be found** related to the development of Algorithmic Thinking ...
.... findings in Computer Science and Computer Education concerned older students and focussed on programming.

By contrast, in the field of mathematical education in general, and the psychology of mathematical education in particular, there is a **wealth of research and accepted theories**. developed over many years (Costello, Teaching and Learning Mathematics 11-16)

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Research findings in Mathematics

Concepts in Secondary Mathematics and Science (1974-79)

wrong answers from inappropriate strategies, sometimes invented

maths is difficult, huge range of attainment amongst pupils of the same age

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Research findings in Mathematics

Assessment of Performance Unit (1977-82)

development of an assessment framework based on concepts, skills and application dividing mathematics into topics - basis for National Curriculum

answered the question - "what percentage of students at what age have accurate understanding"

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What thinking?

facts	recall of terms, simple relationships
skills	standard well-established procedures
conceptual structures	complex and dynamic relationships, mental models
problem solving strategies	analysis, creativity, execution
attitudes	determination, motivation, love of subject, concern for quality & detail

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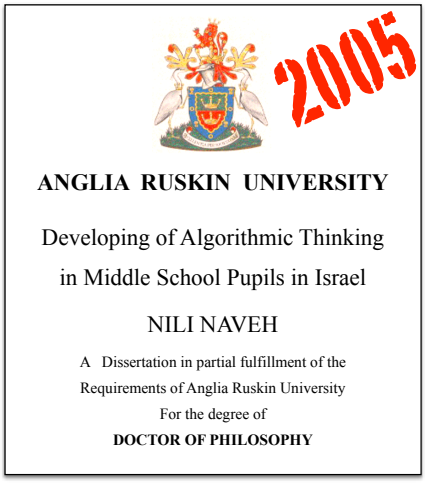

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Algorithmic Thinking

An algorithm can be defined as
a collection of unambiguous executable instructions,
whose step by step execution
leads to a predefined goal,
within a finite number of steps.

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Algorithmic thinking occurs
in the development of algorithms

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Algorithmic Thinking is a
complex intellectual process
of thinking, combining facts, skills, etc.

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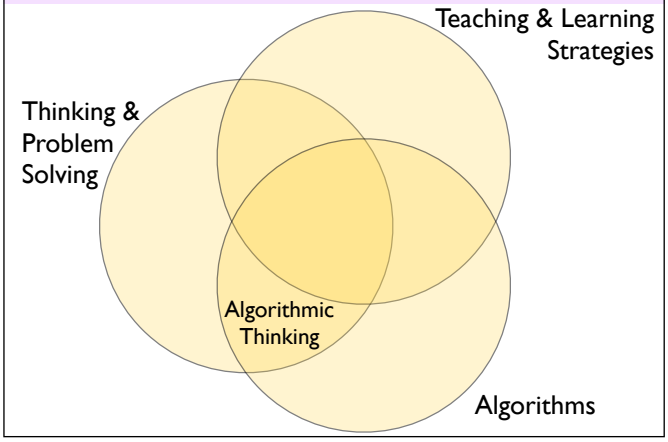
Nili's Conceptual framework



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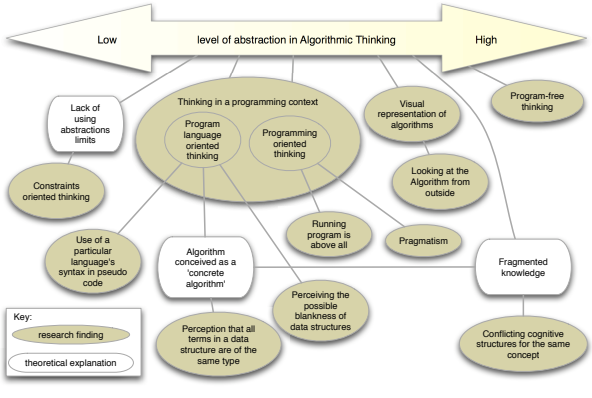
Nili's findings

Figure xx - Phenomena observed at different levels of abstraction, and the relationships between them



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Questions:

1. What other research is there into computing thinking, whether about algorithmic thinking, data structures or programs - facts, skills, conceptual structures, problem solving strategies or attitudes?
2. How can learners benefit?
3. How can practitioners contribute, in the modern age of online collaboration?

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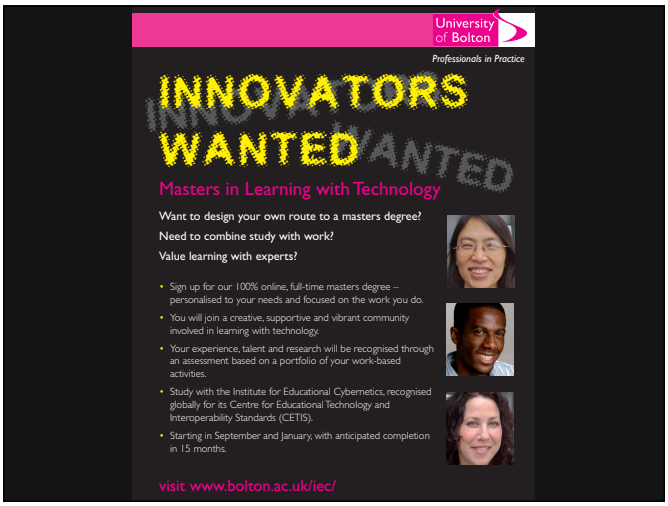

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