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Reflections on the role of Programming in Primary and Secondary Computing Education

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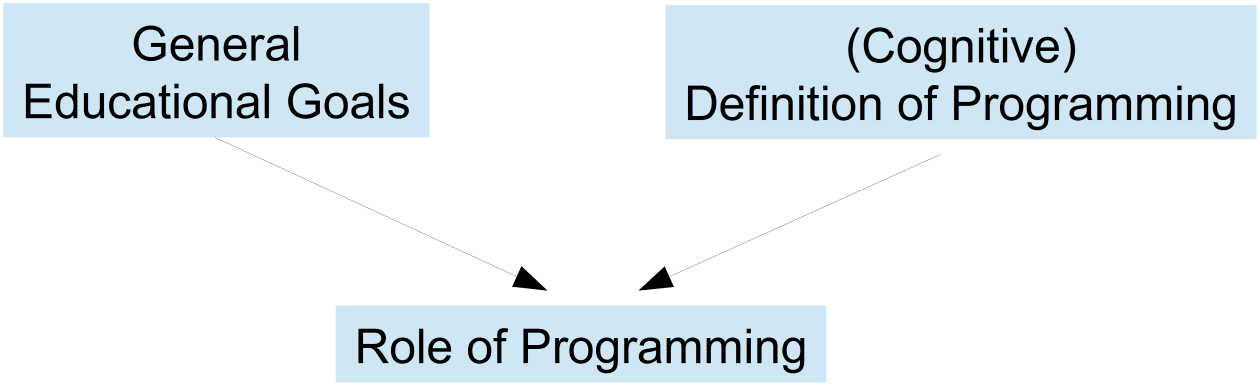
DIDAKTIK DER INFORMATIK

Introduction

- Mandatory programming courses for six year old kids (Estonia?)
- Role of Computing in primary education



Goals of Education UN

full development of the human personality and the sense of its dignity,

participate effectively in a free society,

Goals of Education: GFD

1. **Developing Identity**
2. **Coping with everyday life**
3. **Coping with professional life**
4. **Participation**

Goals of Education

- Development of identity
- Cope with affordances
- Participation in society/democracy

Programming

- (before 1970es): fundamentally easy task, requires learning a programming language

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- (before 1970es): fundamentally easy task, requires learning a programming language
- Programming: designing / modeling and implementing
- Germany: Modeling **vs** Programming
- ITICSE WG: Programming is
  "the process of planning **or** writing a program."

What is programming?

- Programming is a special type of type of interaction with the computer, connected to the loss of direct manipulation and the need to use an abstract notation. Immediate feedback is (often) missing.

Alan F. Blackwell. 2004. End-user developers at home.
CACM 47, 9 (September 2004), 65-66. DOI=10.1145/1015864.1015892

What is programming?

- Programming is a special type of type of interaction with the computer, connected to the loss of direct manipulation and the need to use an abstract notation. Immediate feedback is (often) missing.
- A basic requirement of programming is automation (for later or repeated use of the artifact).
- Programming includes coping with complexity in a specific form; by using self-made representations within the program.
- A program addresses not only the computer as ‘reader’, but also (and probably even more) a human reader, programming therefore includes aspects of a communication process.
- As there is often no clear direct path between the problem and the solution, programming includes a creative process of seeking and finding solutions.
- Programs can be written for personal use, or for others to be used. The affordances for the latter are much higher.

Programming And Education

- Interaction with Computer
- Automation
- Representation
- Human reader
- Seeking solutions
- Personal use, or for others'

- Development of identity
- Cope with affordances
- Participation in society/democracy

(Tool) Building / Participation

Associating the notion of development with constructing, implementing or building

- Participation: maintaining and developing society
- developing~building
    - Digital media
    - Tools
- Programs for others' to use
    - Open source
- Projects

(Tool) Building / Participation

Internal External

- Internal: private,
  Tools for personal use

- Programming: automation
  for later use;
  not necessarily
  programming=programming language
  - Adapting, configuring, “VCR programming”

Participation	Goals / What aspect	Approaches / How aspect
internal	Configuring, adapting, developing digital artifacts for personal use and coping with personal life affordances	Projects
external	Configuring, adapting, developing digital artifacts for use by others and for participating in society	

Expression / Self-Development

The ability to be creative, to communicate, and to self-express

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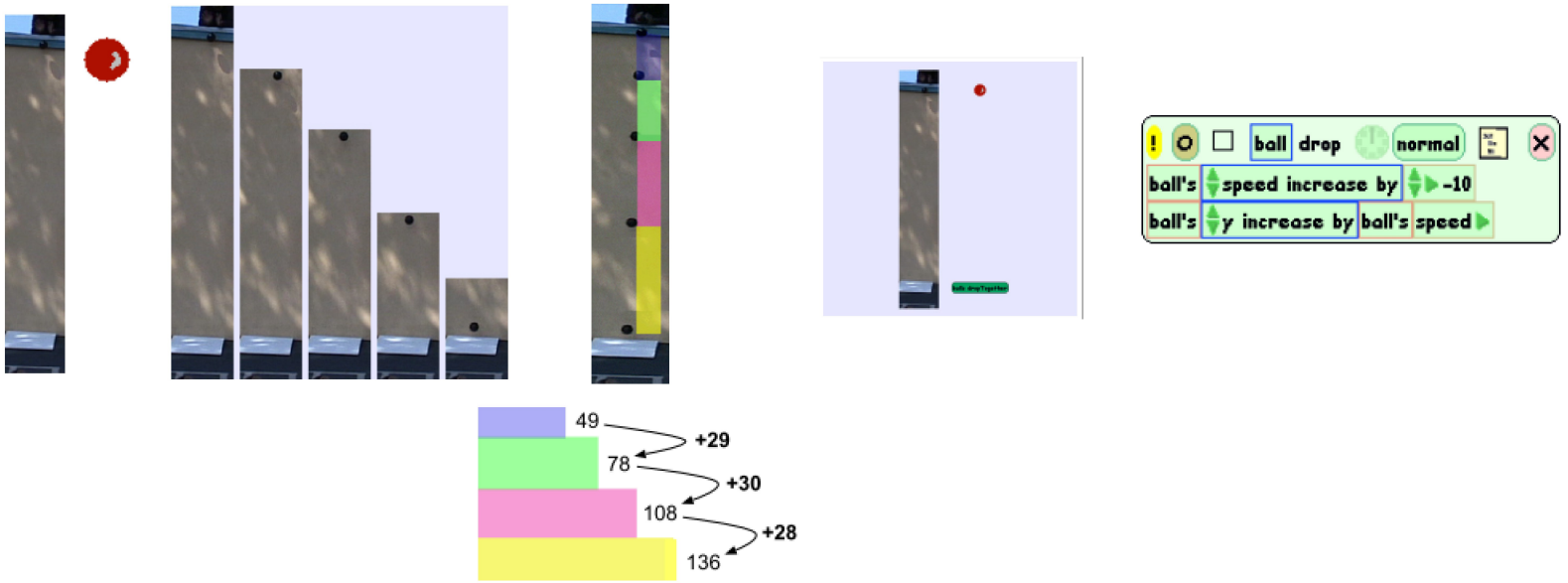
The ability to be creative, to communicate, and to self-express

Expressing	Goals / What aspect	Approaches / How aspect
internal	„Hello world“: ‚Designing‘ digital artifacts for aesthetic or playful reasons	Remixing
external	Designing artifacts for e.g. self-revelation.	

Thinking / Coping with Affordances

Problem solving and thinking



Squeak
Powerful Ideas in the Classroom.
http://www.mttcs.org/Projekte/Squeak/material/ideas_eng.pdf

Thinking / Coping with Affordances

Problem solving and thinking

Thinking	Goals / What aspect	Approaches / How aspect
internal	Analyzing and understanding computational / digital artifacts	Trial and Error / Experiments
external	Understanding Phenomena from the 'analog' world (e.g. Modeling, Simulation; so called 'heuristic programming')	

Summary

	Goals / What aspect	Methods / how aspect
1. Expressing 1a. internal	„Hello world“: ‚Adapting‘ digital artifacts for aesthetic or playful reasons	Remixing Changing code examples
1 b. external	Designing artifacts for e.g. self-revelation / communication	
2. Thinking 2a. internal	Analyzing and understanding computational / digital artifacts	Trial and Error / Experiments
2b. external	Understanding Phenomena from the ‘analog’ world (e.g. Modeling, Simulation; so called ‘heuristic programming’)	
3. Participation 3a. internal	Configuring, adapting, developing digital artifacts for personal use and coping with personal life affordances	Projects
3b. external	Configuring, adapting, developing digital artifacts for use by others and for participating in society	