Self-efficacy of Dutch primary school teachers towards programming education
Meet Alice

Hi!
Dutch primary school teacher
Dutch primary school teacher

female
Dutch primary school teacher

female > 80%\textsuperscript{1}

\textsuperscript{1} Traag (cbs). Leerkracht in het basis onderwijs. 2018.
Dutch primary school teacher

female > 80%

school does nothing with programming
school does nothing with programming
school does nothing with programming
programming
problem solving skills\textsuperscript{3} 

Creativity\textsuperscript{2} 

programming 

learn from mistakes\textsuperscript{3} 

critical thinking\textsuperscript{3}

\textsuperscript{2} Carneli et al. Computing education in k-12 schools: A review of the literature. 2015. 
\textsuperscript{3} Lucassen. Leren programmeren: waarom eigenlijk? 2017 
\textsuperscript{4} van Trigt. Waarom je kinderen wel/niet moet leren programmeren. 2016.
problem solving skills

Creativity

programming

critical thinking

job opportunities

learn from mistakes

---

3 Lucassen. Leren programmeren, waarom eigenlijk? 2017
problem solving skills
creativity
programming
critical thinking

job opportunities
learn from mistakes
understanding the world

3 Lucassen. Leren programmeren: waarom eigenlijk? 2017
problem solving skills

Creativity

programming

critical thinking

learn from mistakes

job opportunities

diversity

understanding the world
programming
school does nothing with programming
school does nothing with programming
Dutch primary school teacher does nothing with programming

female > 80%
Dutch primary school teacher

female > 80%

school does nothing with programming 68 %

5 Kennisnet. Programmeren nog een moeilijk verhaal voor scholen. 2015.
Dutch primary school teacher

female > 80%

school does nothing with programming 68%

low self-efficacy (?)
Dutch primary school teacher

female > 80%

school does nothing with programming 68%

direct instruction

low self-efficacy (?)
direct instruction
discovery learning

direct instruction
discovery learning sometimes

direct instruction regular

Dutch primary school teacher

female > 80%

school does nothing with programming 68%

direct instruction regular

low self-efficacy (?)
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?
self-efficacy
believing in your abilities towards a specific task
self-efficacy
believing in your abilities towards a specific task

adaptive expertise
ability to perform in an unfamiliar situation by using prior experiences and knowledge
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?

quantitative

qualitative
questionnaire
questionnaire

teaching methods in regular education

programming education

self-efficacy

demographics
questionnaire

259 participants
questionnaire

259 participants

152 female
69 male
38 unknown
questionnaire

259 participants

152 female
69 male
38 unknown

age 21–64
mean 39.8
questionnaire

259 participants

152 female
69 male
38 unknown

age 21–64
mean 39.8
57% higher grades
questionnaire

259 participants

152 female
69 male
38 unknown

age 21 - 64
mean 39.8
57% higher grades

66% programming experience
66% programming teaching experience
questionnaire

- Direct instruction
  - Prefer: Orange bar
  - Expect: Magenta bar
- Discovery learning
  - Prefer: Orange bar
  - Expect: Magenta bar

Amount of teachers

- Prefer: 100
- Expect: 60
- Prefer: 70
- Expect: 140
questionnaire
questionnaire

self-efficacy science teaching pre-service teachers

<table>
<thead>
<tr>
<th>year</th>
<th>mean</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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Velthuis et al. Teacher training and pre-service primary teachers' self-efficacy for science teaching, 2014
questionnaire
questionnaire

gender
questionnaire

gender

grade
questionnaire
programming experience
gender
grade
questionnaire

programming

experience

gender

grade

programming

teaching experience
direct instruction
regular
direct instruction
regular

female
> 80%

school does nothing with programming
68%
direct instruction
regular

female
> 80%

school does nothing
with programming
68%

low self-efficacy
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?
experiment

10 teachers
experiment

direct instruction  discovery learning
experiment

direct instruction  \[\leftrightarrow\]  discovery learning

- learning objective
- prior knowledge
- guided practice
- practice with assignment
- recap
experiment

direct instruction

learning objective
prior knowledge
guided practice
practice with assignment
recap

discovery learning

‘brainstorm’
demonstration
working on program
Share results
experiment

direct instruction  discovery learning

4 programming lessons in Scratch
experiment
Experiment

Pre-measurements
- pre-questionnaire
  - self-efficacy towards programming in Scratch
- pre-interview
  - self-efficacy
  - teaching preferences
  - experience programming education

Intervention
- Teaching four programming lessons in Scratch by using discovery learning

Intervention
- Teaching four programming lessons in Scratch by using direct instruction

Post-measurements
- post-questionnaire
  - self-efficacy towards programming in Scratch
  - adaptive expertise
- post-interview
  - evaluation lessons
  - self-efficacy
  - adaptive expertise
experiment

direct instruction  discovery learning
experiment

direct instruction \quad \leftrightarrow \quad discovery learning

+11.8 \quad +8 \quad +8.5 \quad +9.5 \quad +7.4 \quad +3

+4.5 \quad -2 \quad -20 \quad -4.5
experiment

direct instruction

adaptive expertise

[Diagram of two groups of people with numbers indicating differences: +11.8 +8 +8.5 +9.5 +7.4 +3

+4.5 -2

-20 -4.5]
experiment

lack of knowledge in Scratch
lack of knowledge in Scratch

‘I though programming was for mathkids and mathematicians and that it was really a far-from-my-bed show. That it is just not for me at all. [...] so in the beginning I really thought “is this it?”, that is really simple.’
experiment

direct instruction  discovery learning

fun
insecure
excited/tense

fun
insecure
frustration
disappointment
'I can easily hide behind it; if I do not know something, I can say "discover it yourself."'
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?

Both teaching methods can have a positive effect on teachers’ self-efficacy.
What is the effect of teaching methods on the self-efficacy of Dutch primary school teachers towards programming education?

Both teaching methods can have a positive effect on teachers' self-efficacy.

discovery learning

negative feelings

decrease self-efficacy
educational materials
professional development
teacher training
educational materials
professional development
teacher training
educational materials
professional development
teacher training

modified instruments
future research
publication
Dutch primary school teacher
female > 80%
female

school does nothing with programming 68%
direct instruction regular
direct instruction

low self-efficacy (?)

programming experience
programming teaching experience

+11.8 +8 +8.5 +9.5 +7.4 +3
+4.5 -2

-20 -4.5

modified instruments
educational materials
professional development
future research

modified instruments
educational materials
professional development
future research

grade
gender
Dutch primary school teacher

female > 80%

direct instruction
regular

school does nothing with programming 68%

low self-efficacy (?)

programming experience

programming teaching experience

direct instruction

discovery learning

+11.8  +8  +8.5  +9.5  +7.4  +3

+4.5  -2  

-20  -4.5

thank you

gender

grade

modified instruments

future research

publication

educational materials

professional development

teacher training