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MODULES FOR OPEN SEARCH IN MATHEMATICS TEACHING

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How to reach people?

- **Children and youths** can have great influence on problem awareness and decision making in society (e.g. „Fridays for Future“; waste sorting; use of plastic)
 - Children and youths can argue across from their parents and impact action strategies

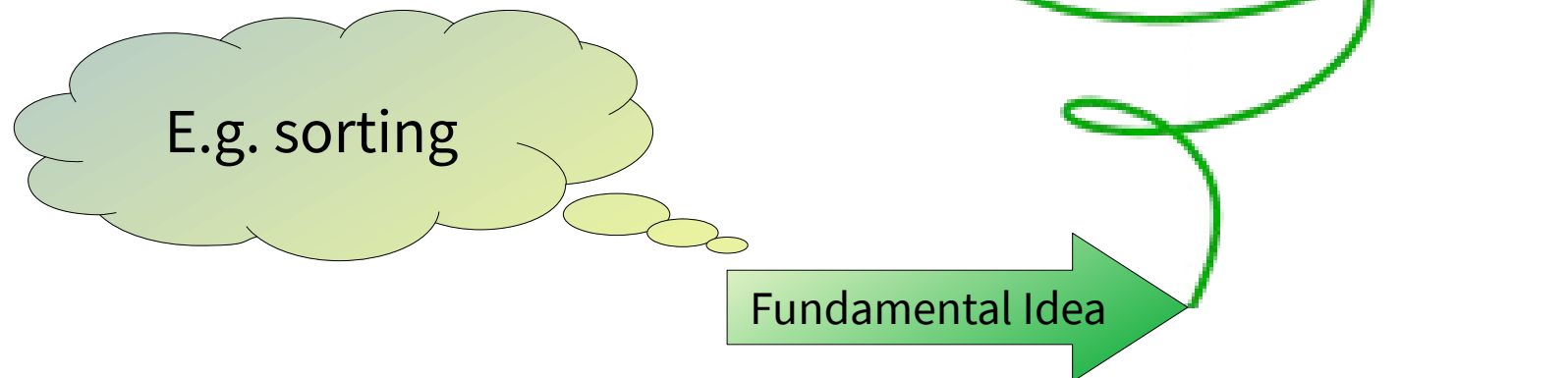
BMU (2018)



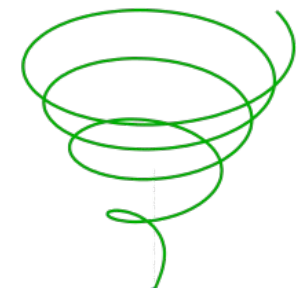
How to reach children?

How to reach children?

Identify **fundamental ideas** of Open Search and link directly to the existing (mathematics) curriculum.



Fundamental Idea „Sorting“



Bubble Sort in Kindergarten

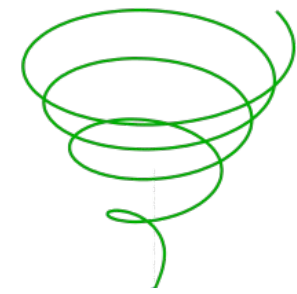


mathematical competencies:

- measuring & sizes (KMK, 2004, p. 10 & 11)
- communicating and arguing (KMK, 2004, p. 8)

Sönnerås (2019)

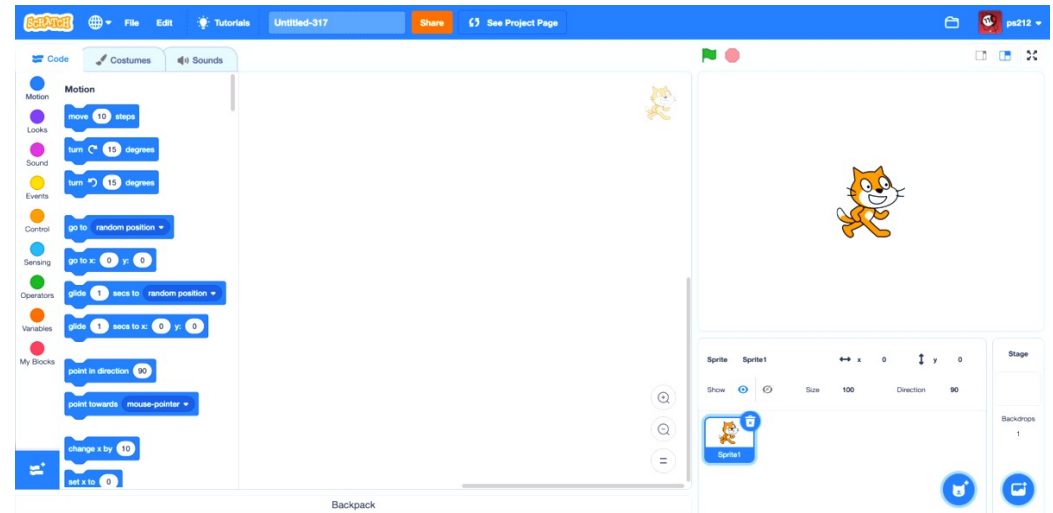
Fundamental Idea „Sorting“



Searching as a game

Coding in Scratch:

- 1) The computer thinks up a number and gives hints
- 2) The child thinks up a number and gives feedback to the computer, if the guessed number is too big or too small or the right number

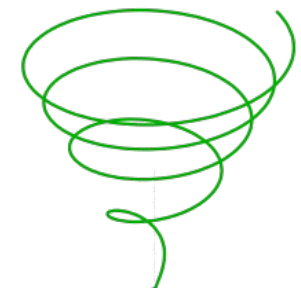


Schwätzer (2018)

mathematical competencies:

- understanding of number relations and sorting of numbers by size (KMK, 2004, p. 9)
- problem-solving (systematic sampling) (KMK, 2004, p. 7)

Fundamental Idea „Sorting“



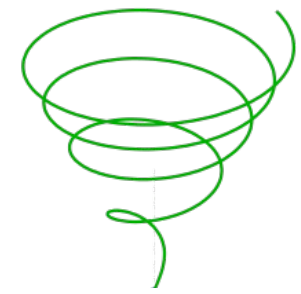
Which drinking chocolate do you like most?

→ *ranking of drinking chocolates starting with the most popular (e.g. drinking chocolate A)*

mathematical competencies:

- data, frequency and probability (KMK, 2004, p. 11)
- arguing (KMK, 2004, p. 8)

Fundamental Idea „Sorting“

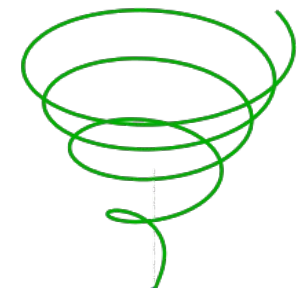


What would happen if the school kiosk would have a contract with a drinking chocolate provider, whose drinking chocolate (drinking chocolate B) is not liked by most of the children?

Intransparent sorting

→ *discussion about issues (e. g. economic interests) that could influence a ranking*

Fundamental Idea „Sorting“

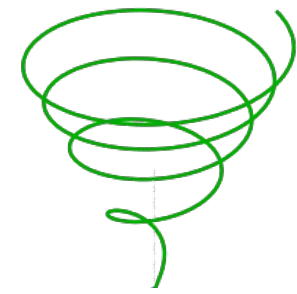


Assignment of search results
based on user profiling.

Do you like drinking chocolate C?



Fundamental Idea „Sorting“

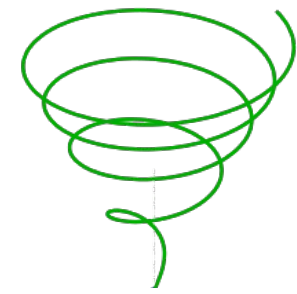


Topic:
„microplastic,
plastic bottle,
food chain“

Ranking and visits of
results of search
engines

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Open [icon] *Untitled Document 1 Save [icon] [icon] [icon] [icon]
1 Result 1: (5 Visists)
2
3 Plastic or glass: a new environmental ... - SpringerLink
4 https://link.springer.com > article
5 by R Stefanini · 2021 · Cited by 16 – Plastic or glass: a new environmental assessment
  with a marine litter indicator for the comparison of pasteurized milk bottles.
6
7 Result 2: (7 Visists)
8
9 Use of plastic waste (poly-ethylene terephthalate) - Semantic ...
10 https://www.semanticscholar.org > paper > Use-of-plastic-...
11 The results introduce an asphalt mix that has properties that makes it suitable ... of
  using PET waste in asphalt concrete mixes as aggregate replacement ...
12
13 Result 3: (0 Visists)
14
15 Motivating actions to mitigate plastic pollution - Nature
16 https://www.nature.com > ... > comment
17 by L Jia · 2019 · Cited by 36 – An individual's mitigation actions can be motivated
  through increasing behavioural costs, such as bans and taxation. For example,
  estimates ...
18
19 Result 4: (16 Visits)
20
21 (PDF) Microplastics in oceans - ResearchGate
22 https://www.researchgate.net > ... > Microplastics
23 Microplastics are persistent and cannot be easily removed from the marine environment
  (Zarlf et al., 2011) . Microplastics are more harmful than bigger plastic ...
Plain Text ▾ Tab Width: 8 ▾ Ln2, Col 1 ▾ INS
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Fundamental Idea „Sorting“



Statistics of Page Visits:

Create a discrete probability distribution on the number of considered pages

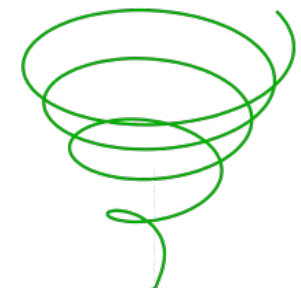
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Open [icon] *Untitled Document 1 Save [icon] [icon] [icon] [icon]
1 Result 1: (5 Visists)
2
3 Plastic or glass: a new environmental ... - SpringerLink
4 https://link.springer.com › article
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  (Zarlf et al., 2011) . Microplastics are more harmful than bigger plastic ...
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mathematical competencies:

- data & randomness (KMK, 2012, p. 21)
- mathematical arguing (KMK, 2004, p. 11)

Schupp (1982)

Fundamental Idea „Sorting“



Ranking according to...

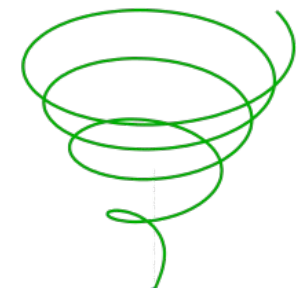
... page visits

Result 4	16 Visits	$\frac{16}{28}$
Result 2	7 Visits	$\frac{7}{28}$
Result 1	5 Visits	$\frac{5}{28}$
Result 3	0 Visits	$\frac{0}{28}$

... payment

Result 3	0 Visits	3500 €
Result 1	5 Visits	2100 €
Result 4	16 Visits	500 €
Result 2	7 Visits	500 €

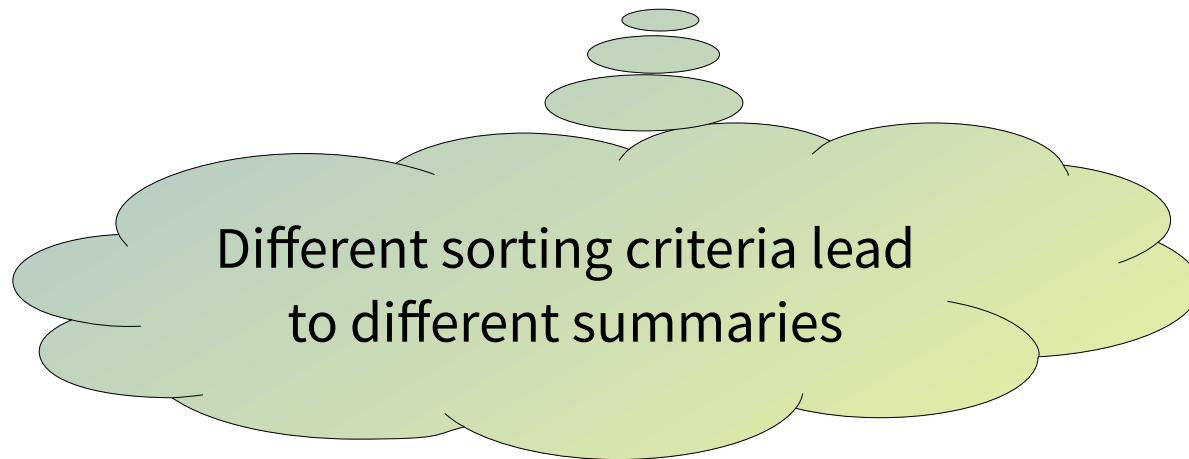
Fundamental Idea „Sorting“



Procedure in short:

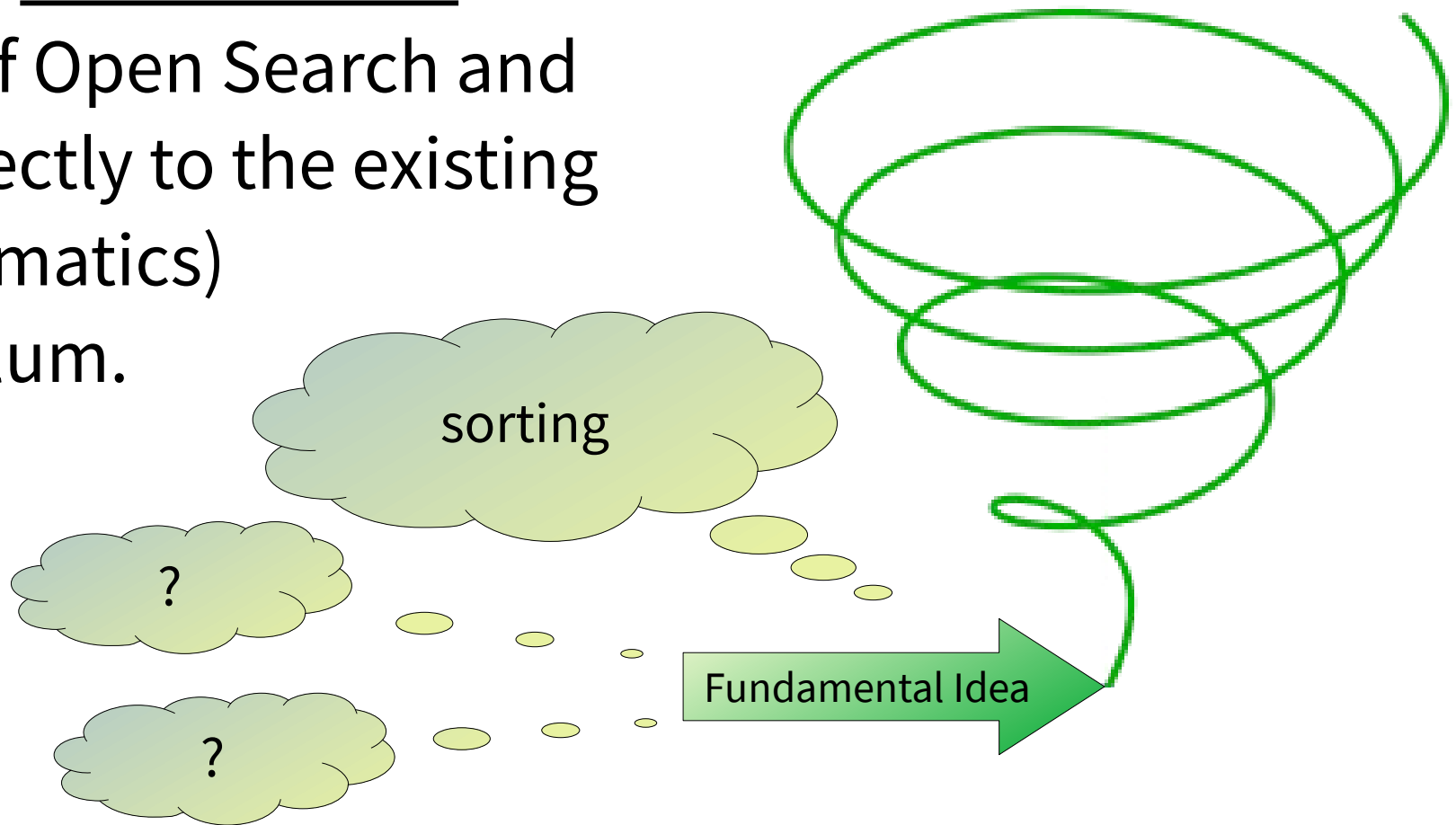
- 1) The results in different orders are presented to different students.
- 2) The students are requested to create a summary of the topic.

→ The learners who receive a particular designed order of search results will produce a different summary of the topic than another group of learners who receive a different order.



Conclusion & Next Steps

Identify **fundamental ideas** of Open Search and link directly to the existing (mathematics) curriculum.



Thank you very much **for your attention!**

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