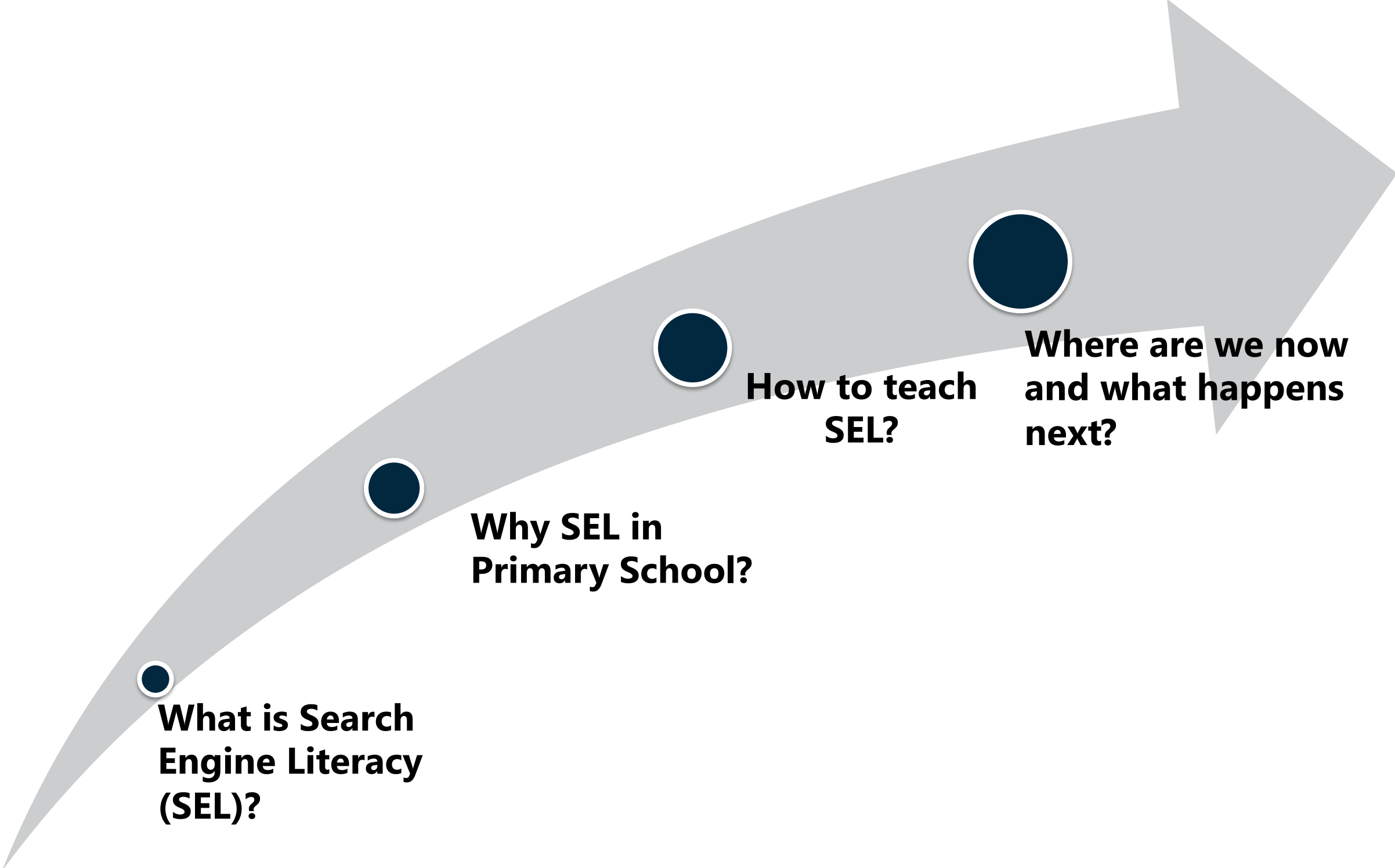




Developing and promoting
search engine literacy
in primary education

Prof. Dr. Melanie Platz,
Dr. Friederike Klan &
Prof. Dr. Alexander Decker



**What is Search
Engine Literacy
(SEL)?**

**Why SEL in
Primary School?**

**How to teach
SEL?**

**Where are we now
and what happens
next?**

What is Search Engine Literacy?

Information Literacy

Information literacy is the ability to understand when information is needed, to seek information efficiently, and evaluate and use information appropriately. It also includes integrating new information with prior knowledge and using it legally, economically, socially, and ethically correct to achieve goals.

Search Literacy

Search literacy is a specific aspect of information literacy. It relates directly to the process of obtaining information and refers to the ability to find and access the desired information to satisfy information needs efficiently and effectively.

Search Engine Literacy

Achieving accurate search results requires **search engine literacy**, which is the knowledge of how search engines work and the following: findability, linguistic functions, query language, and ranking.

Project „PrimaSearch“ (Uni Saarland, TH Ingolstadt, DLR_School_Labs); cf. Fuhr (2014)

Why Search Engine Literacy in Primary School?

Search Engine Literacy in Primary School

Primary school children mostly use search engines like Google (KIM, 2020; Feil, Gieger & Grobbing, 2013) without knowing or questioning how they work (Le Deuff, 2017).



Lisa, grade 1, words with „G“



Developing and acquiring the skills needed to live in a digital world goes far beyond the necessary basic knowledge of information technology and affects **all subjects**. Therefore, they **cannot be assigned to an isolated learning area**.



KMK, 2016, p. 12



Bildung in der digitalen Welt
Strategie der
Kultusministerkonferenz

direct link with "traditional" mathematical teaching topics





In concrete terms, this means that teachers must be able to use digital media in their respective subject lessons in a **professional and didactically meaningful way** and to **reflect on their content** in accordance with the educational mandate.

KMK, 2016, p. 24



Bildung in der digitalen Welt
Strategie der
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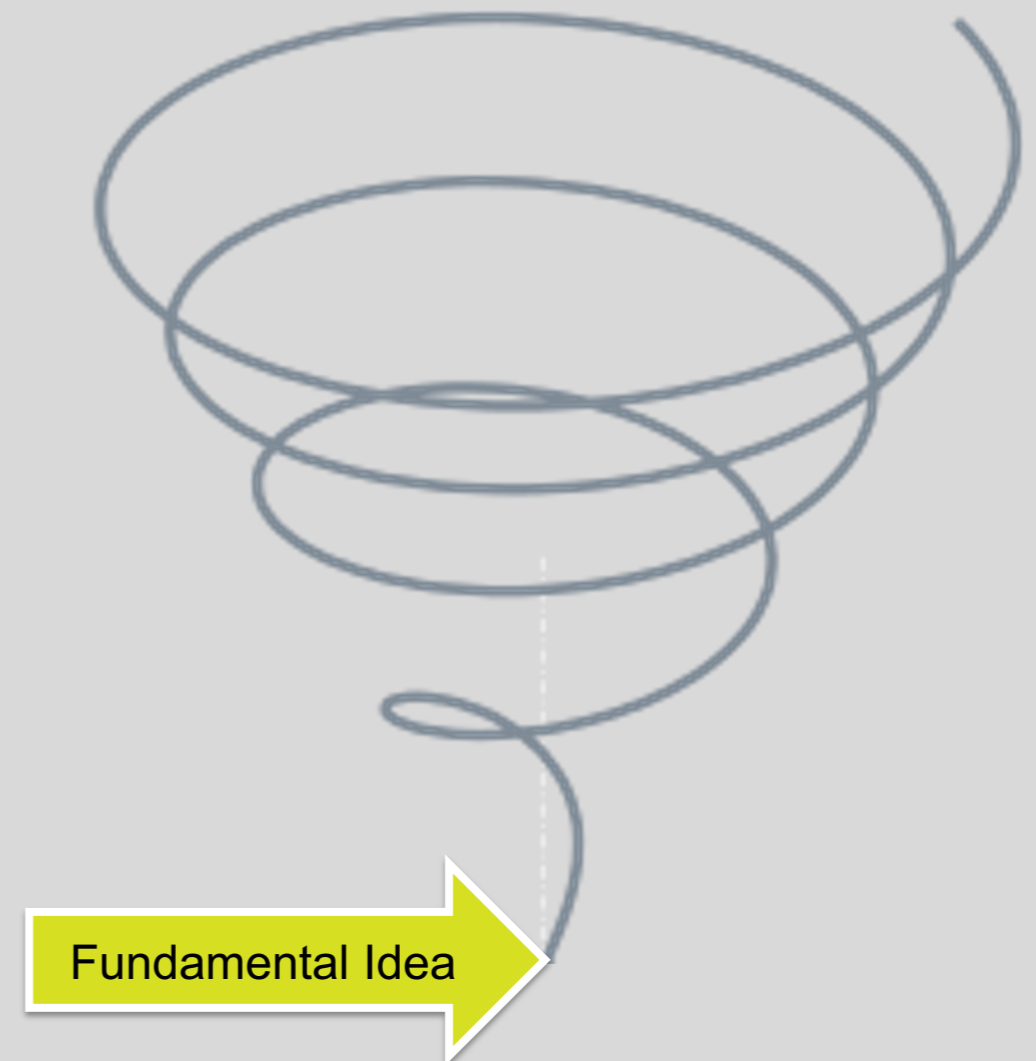
Behind the simplicity and the clear interface of currently popular search engines hides a complexity that is not understood by many users.



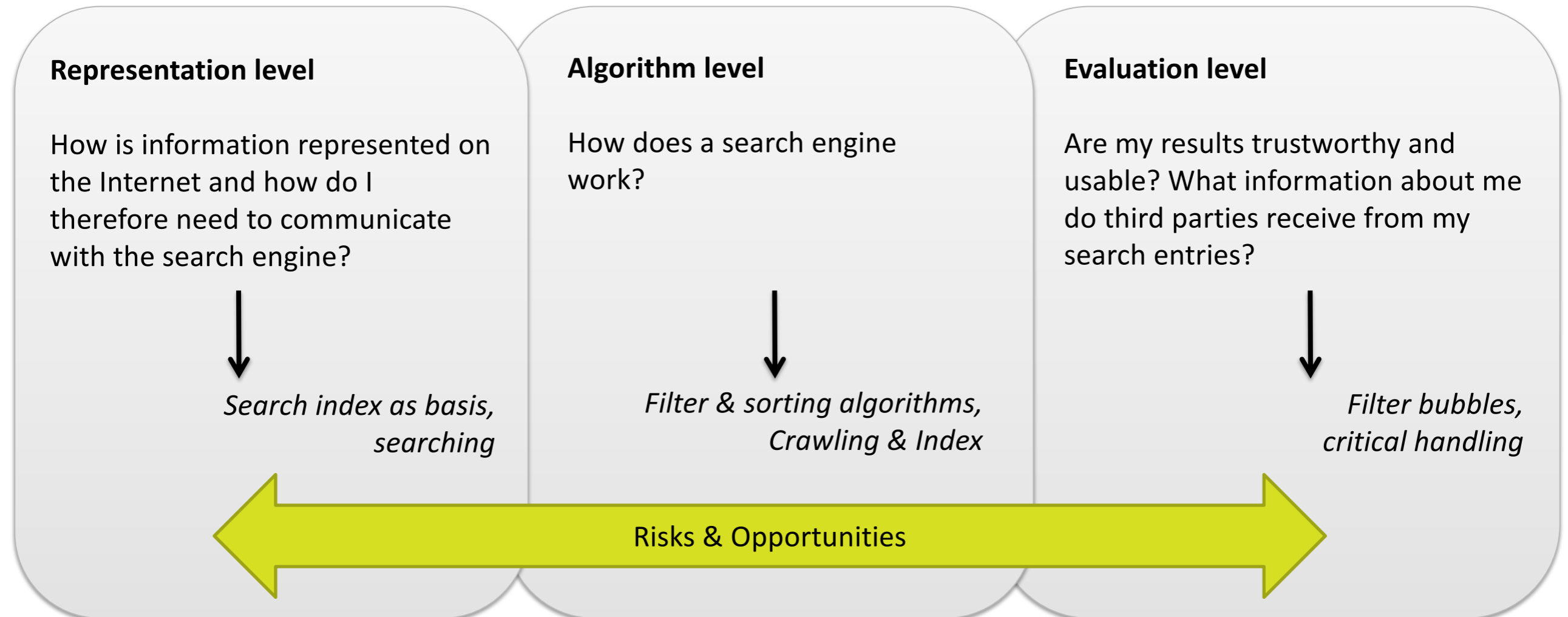
How to teach Search Engine Literacy

Teaching Concept

Identification of **Fundamental**
Ideas of **Search Engine Literacy**
in direct relation with the
traditional curriculum.



Platz, Müller, Niehaus & Müller (2021)



Goal: to understand a concept in a theoretically sound way (topic "algorithms" (Etzold et al., 2019) transferred to "search engines" and extended by a reflection)

Initial example

· First, an initial example is discussed intensively. This must be characteristic for the concept to be formed, i.e. the essence of the concept must be particularly well recognizable and tangible in it. It should not be a special case, but also not contain too many additional components that distract from the actual concept.

Initial abstraction

· After the initial example has been discussed, the essence of the term is worked out and formulated as an initial abstraction. This can be, for example, a definition suitable for children. It is important that it is actually a general formulation. This means that references to the initial example can and should be made, but they do not play a role in the formulation of the abstraction itself.

Concretizations

Now the initial abstraction is applied to further examples, the concretizations. In doing so, the initial abstraction is worked with, reasons are given why it is applicable or why the examples contain certain properties, etc. Through this occupation, the essence of the concept is once again penetrated and better internalized.

Reflection

Consequences for dealing with search engines are drawn and "guidelines" for optimized search are formulated.

Example: Ranking

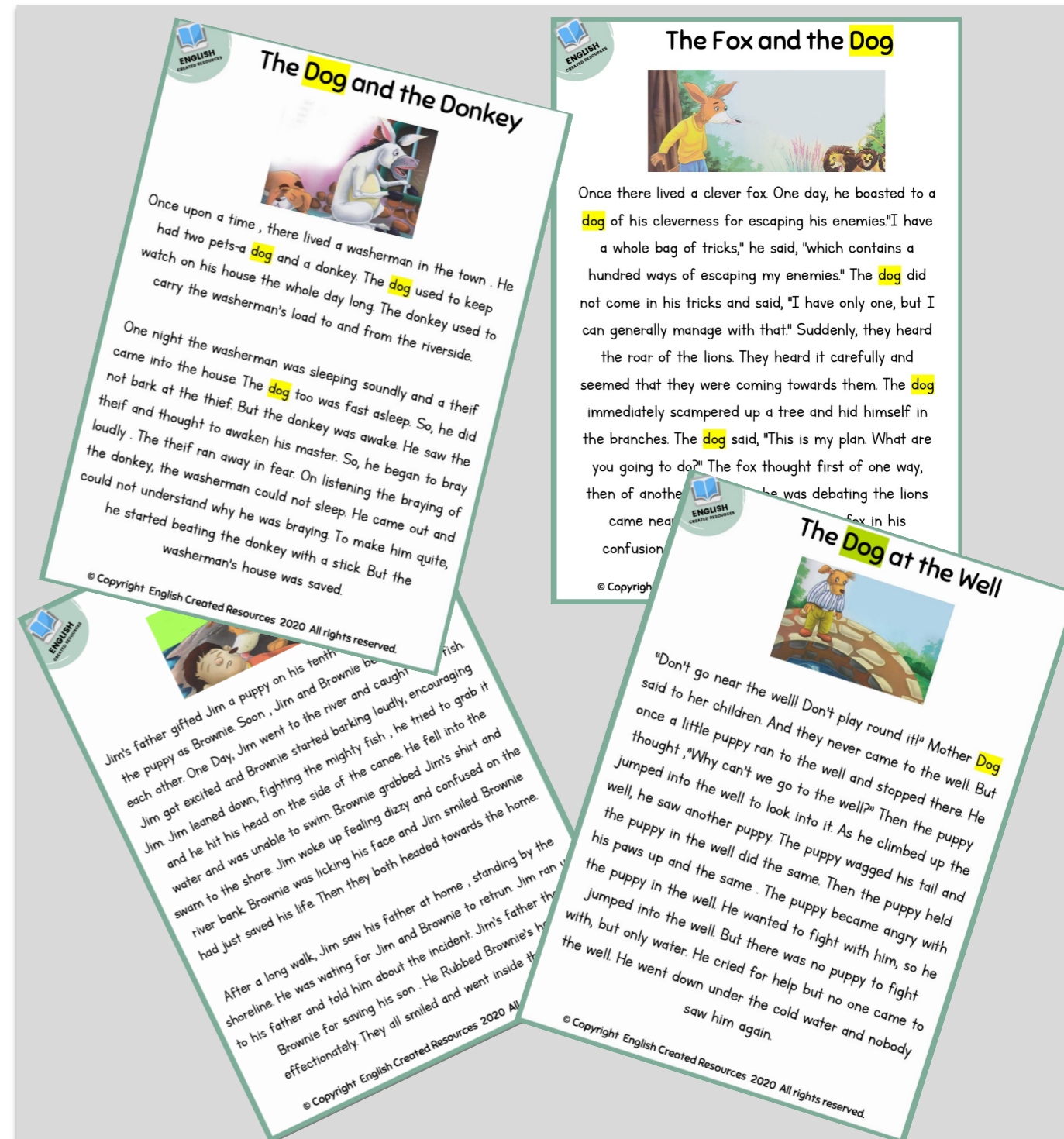
Text statistics are used to compare search queries and documents.

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- frequency determination
- search of text sections of the same length for a specific search term
- e.g., „dog“



The collage shows four pages from a children's book. The top-left page is titled "The Dog and the Donkey" and features an illustration of a dog and a donkey. The top-right page is titled "The Fox and the Dog" and features an illustration of a fox and a dog. The bottom-left page is titled "The Dog at the Well" and features an illustration of a dog and a well. The bottom-right page is also titled "The Dog at the Well" and features an illustration of a dog and a well. The word "dog" is highlighted in yellow in all four pages. The text on the pages is as follows:

The Dog and the Donkey
Once upon a time, there lived a washerman in the town. He had two pets—a dog and a donkey. The dog used to keep watch on his house the whole day long. The donkey used to carry the washerman's load to and from the riverside.
One night the washerman was sleeping soundly and a thief came into the house. The dog too was fast asleep. So, he did not bark at the thief. But the donkey was awake. He saw the thief and thought to awaken his master. So, he began to bray loudly. The thief ran away in fear. On listening the braying of the donkey, the washerman could not sleep. He came out and could not understand why he was braying. To make him quite, he started beating the donkey with a stick. But the washerman's house was saved.

The Fox and the Dog
Once there lived a clever fox. One day, he boasted to a dog of his cleverness for escaping his enemies. "I have a whole bag of tricks," he said, "which contains a hundred ways of escaping my enemies." The dog did not come in his tricks and said, "I have only one, but I can generally manage with that." Suddenly, they heard the roar of the lions. They heard it carefully and seemed that they were coming towards them. The dog immediately scampered up a tree and hid himself in the branches. The dog said, "This is my plan. What are you going to do?" The fox thought first of one way, then of another. He was debating the lions came near. The fox in his confusion.

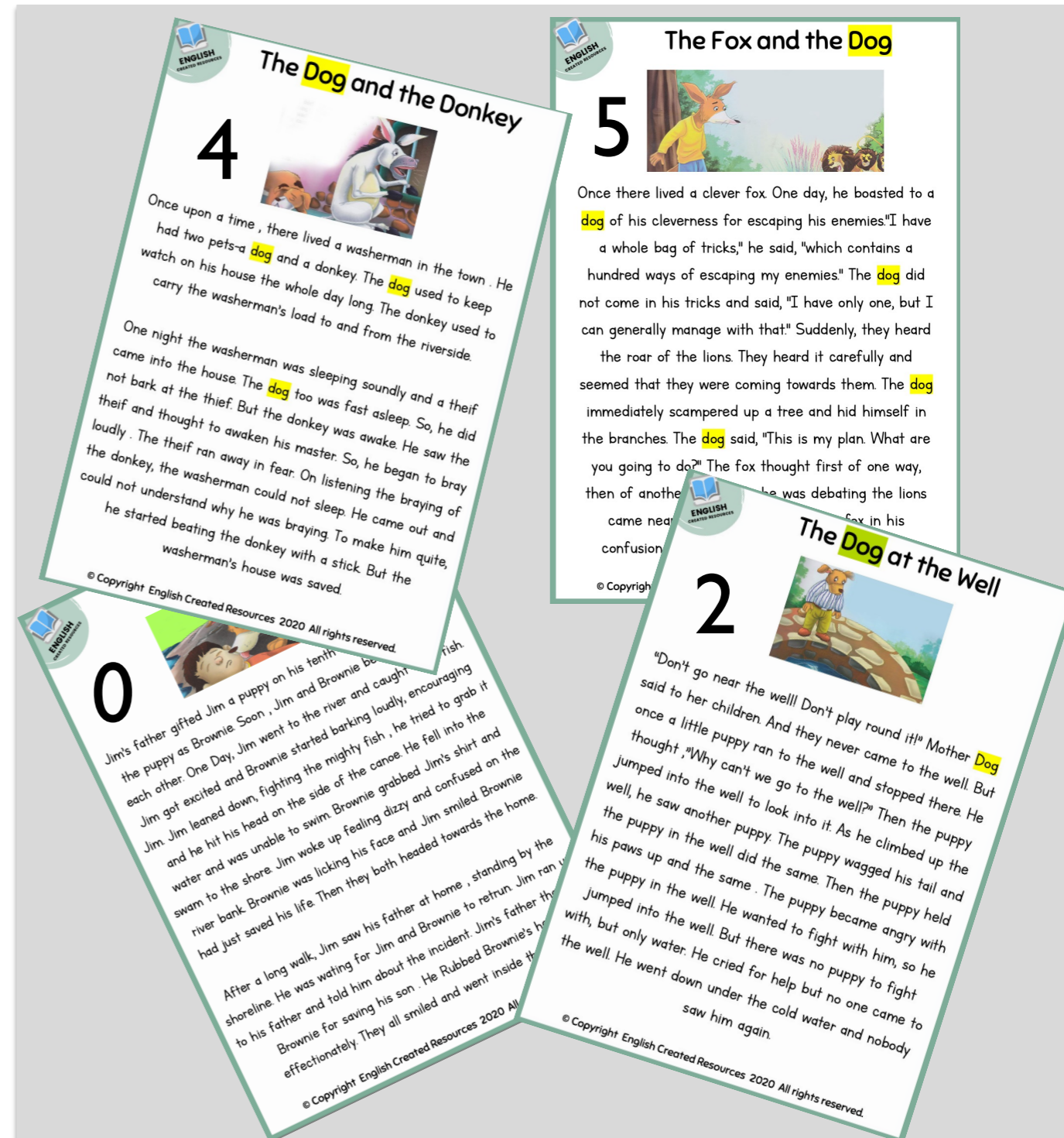
The Dog at the Well
"Don't go near the well! Don't play round it!" Mother Dog said to her children. And they never came to the well. But once a little puppy ran to the well and stopped there. He thought, "Why can't we go to the well?" Then the puppy jumped into the well to look into it. As he climbed up the well, he saw another puppy. The puppy wagged his tail and the puppy in the well did the same. Then the puppy held his paws up and the same. The puppy became angry with the puppy in the well. He wanted to fight with him, so he jumped into the well. But there was no puppy to fight with, but only water. He cried for help but no one came to the well. He went down under the cold water and nobody saw him again.

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The collage shows four pages from children's books. Each page has the word 'dog' highlighted in yellow. The pages are numbered 4, 5, 0, and 2. The stories are 'The Dog and the Donkey', 'The Fox and the Dog', 'The Dog at the Well', and an unnamed story on page 0. Each page includes an illustration and a copyright notice for 'English Created Resources 2020 All rights reserved.'

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0
Jim's father gifted Jim a puppy on his tenth birthday. The puppy as Brownie. Soon, Jim and Brownie became best friends. One day, Jim went to the river and caught a fish. Jim got excited and Brownie started barking loudly, encouraging Jim. Jim leaned down, fighting the mighty fish, he tried to grab it and he hit his head on the side of the canoe. He fell into the water and was unable to swim. Brownie grabbed Jim's shirt and swam to the shore. Jim woke up feeling dizzy and confused on the river bank. Brownie was licking his face and Jim smiled. Brownie had just saved his life. Then they both headed towards the home.
After a long walk, Jim saw his father at home, standing by the shoreline. He was waiting for Jim and Brownie to return. Jim ran to his father and told him about the incident. Jim's father hugged Brownie for saving his son. He rubbed Brownie's head affectionately. They all smiled and went inside the house.

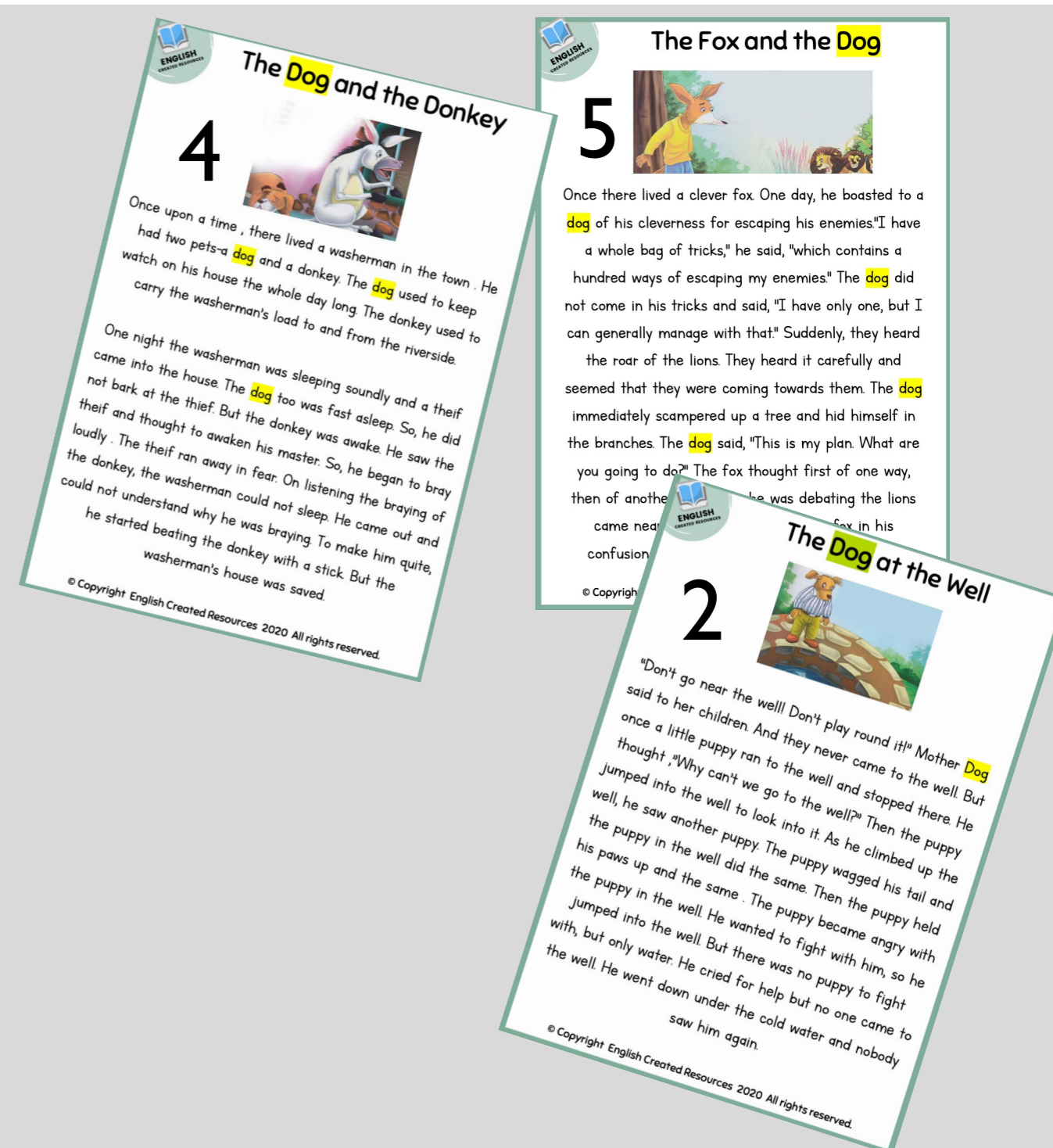
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"Don't go near the well! Don't play round it!" Mother Dog said to her children. And they never came to the well. But once a little puppy ran to the well and stopped there. He thought, "Why can't we go to the well?" Then the puppy jumped into the well to look into it. As he climbed up the well, he saw another puppy. The puppy wagged his tail and the puppy in the well did the same. Then the puppy held his paws up and the same. The puppy became angry with the puppy in the well. He wanted to fight with him, so he jumped into the well. But there was no puppy to fight with, but only water. He cried for help but no one came to the well. He went down under the cold water and nobody saw him again.

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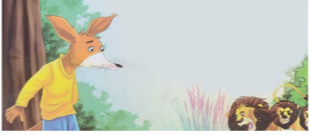
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5 **The Fox and the Dog**



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4 **The Dog and the Donkey**




Upon a time, there lived a washerman in the town. He had two pets—a **dog** and a donkey. The **dog** used to keep watch on his house the whole day long. The donkey used to carry the washerman's load to and from the riverside.

One night the washerman was sleeping soundly and a thief crept into the house. The **dog** too was fast asleep. So, he did not bark at the thief. But the donkey was awake. He saw the thief and thought to awaken his master. So, he began to bray loudly. The thief ran away in fear. On listening the braying of the donkey, the washerman could not sleep. He came out and could not understand why he was braying. To make him quite, he started beating the donkey with a stick. But the washerman's house was saved.

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"Don't play round it!" Mother **Dog** said. And they never came to the well. But one day a puppy ran to the well and stopped there. He said, "Don't we go to the well?" Then the puppy looked into it. As he climbed up the other side, he saw a puppy. The puppy wagged his tail and said, "Hello!" The puppy held up his tail and the other puppy did the same. Then the puppy held up his paws up and the same. The puppy became angry with the puppy in the well. He wanted to fight with him, so he jumped into the well. But there was no puppy to fight with, but only water. He cried for help but no one came to the well. He went down under the cold water and nobody saw him again.

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1.

2.

3.

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A ranking of search results for a search term can be created by first **excluding the texts**, mathematical objects, etc., that **do not contain the search term**. Afterward, the order in which the texts, mathematical objects, etc., are to be displayed can be determined using **frequency determination**. The text, mathematical object, etc., in which **the search term is found most often, comes first**, the text, mathematical object, etc., in which **the search term occurs second most often, comes second**, and so on.

Concretizations

Concretizations

Now the initial abstraction is applied to further examples, the concretizations. In doing so, the initial abstraction is worked with, reasons are given why it is applicable or why the examples contain certain properties, etc. Through this occupation, the essence of the concept is once again penetrated and better internalized.




- On the set of numbers up to 20, "large, even" is searched for.
- On the set of geometric solids {cube, sphere, cone, triangular-based pyramid, cylinder} "face" is searched.

Consideration of structural information
in documents:


What are "meaningful" search results that help the searcher?

→the idea of quality control can be stimulated

- the **formulation** of the search query is essential
- **not only the first hits** should be considered but also subsequent ones since the ranking "is always only one of many possible algorithmic views of the contents of the World Wide Web" (Lewandowski, 2021, p. 93)



Jim's Puppy



Jim's father gifted Jim a puppy on his tenth birthday. Jim named the puppy as Brownie. Soon , Jim and Brownie beacme fond of each other. One Day, Jim went to the river and caught a big fish. Jim got excited and Brownie started barking loudly, encouraging Jim. Jim leaned down, fighting the mighty fish , he tried to grab it and he hit his head on the side of the canoe. He fell into the water and was unable to swim. Brownie grabbed Jim's shirt and swam to the shore. Jim woke up fealing dizzy and confused on the river bank Brownie was licking his face and Jim smiled. Brownie had just saved his life. Then they both headed towards the home.

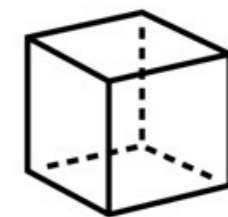
After a long walk, Jim saw his father at home , standing by the shoreline. He was wating for Jim and Brownie to retrun. Jim ran up to his father and told him about the incident. Jim's father thanked Brownie for saving his son . He Rubbed Brownie's head effectonately. They all smiled and went inside the home

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Which number is larger?

2 18

How many faces?



Not reinventing the wheel

Based on this idea, **existing** concepts of SEL can be **transferred** to the primary school level.

WebFinder
search engine

Search...

Observe the results (in the left side).

Observe the database. According to you, what are the **two items** taken into account in the ranking of the results?

The addition of keywords (relevance):

Check

Database:

You can sort each column by clicking on its title. To sort two or three columns at the same time, sort one column then press SHIFT while clicking on the new column you want to sort.

Title of the webpage (< title >)	URL address	Text	Number of links, on the Web, to this page	Number of hits on this page	Score for hits	Number of words in lemma "digestion" in text	Score for words	Page Rank
Digestion - Wikipedia	en.wi...	Digestion is the breakdown of large insoluble food molecules into small water-soluble food molecules so that they can be absorbed into the watery blood...	10	56100	14	115	14	28
Digestion facts, information, pictures Encyclopedia.com	www.e...	DIGESTION CONCEPT Digestion is the process whereby the foods we eat pass through our bodies and are directed toward the purposes of either providing ...	4	3821	2	67	12	14
Digestive Disorders and Digestive Health Center - WebMD	www.w...	Digestive Disorders Overview Common digestive problems include heartburn/GERD, IBD, and IBS. Symptoms may include bloating, diarrhea, gas, stomach ...	21	15497	6	1	2	8
Digestion - ScienceDaily	www.s...	Digestion is the process whereby a biological entity processes a substance, in order to chemically convert the substance into nutrients. Digestion ...	61	24601	8	6	2	10
Your Digestive System - KidsHealth	kidsh...	So there you are, sitting at lunch, enjoying some grilled-chicken pizza and a few orange wedges. When you're finished, you take a last drink of milk, ...	61	13045	6	8	2	8
digestion biology Britannica.com	www.b...	Digestion, sequence by which food is broken down and chemically converted so that it can be absorbed by the cells of an organism and used to maintain...	21	24520	8	50	10	18

Le Deuff (2017); <https://iddocs.fr/webfinder/index.php>

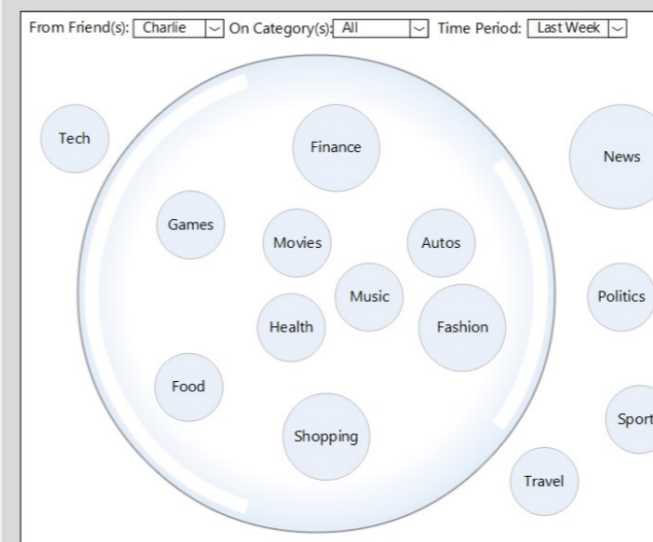


Figure 1. Anna's "category view" of her filter bubble related to Charlie's posts

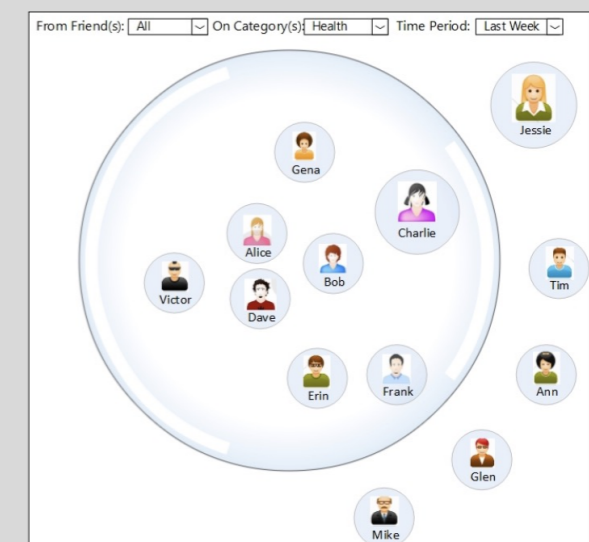
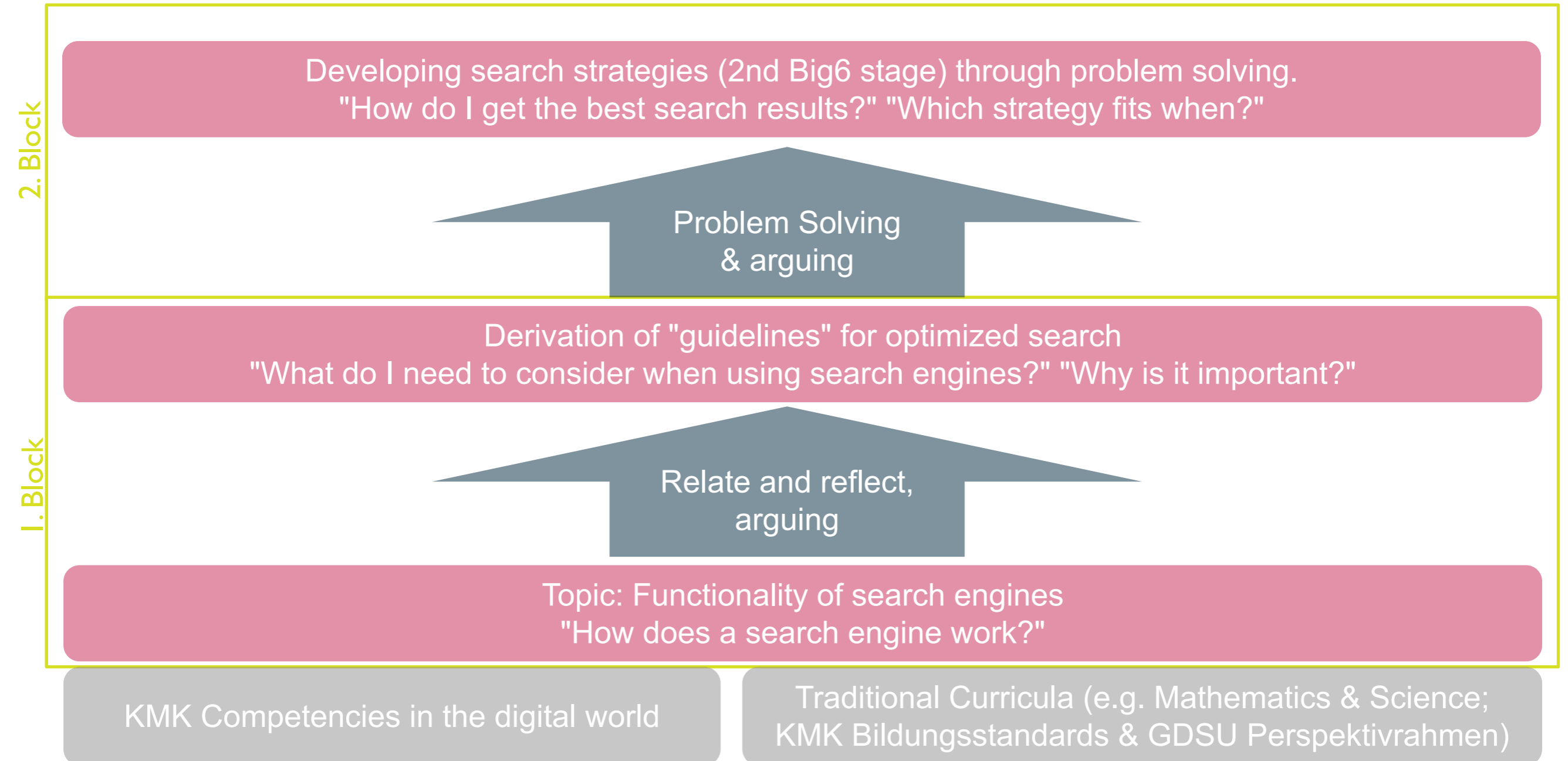


Figure 2. Anna's "friends view" of her filter bubble related to a certain category of posts ("health")

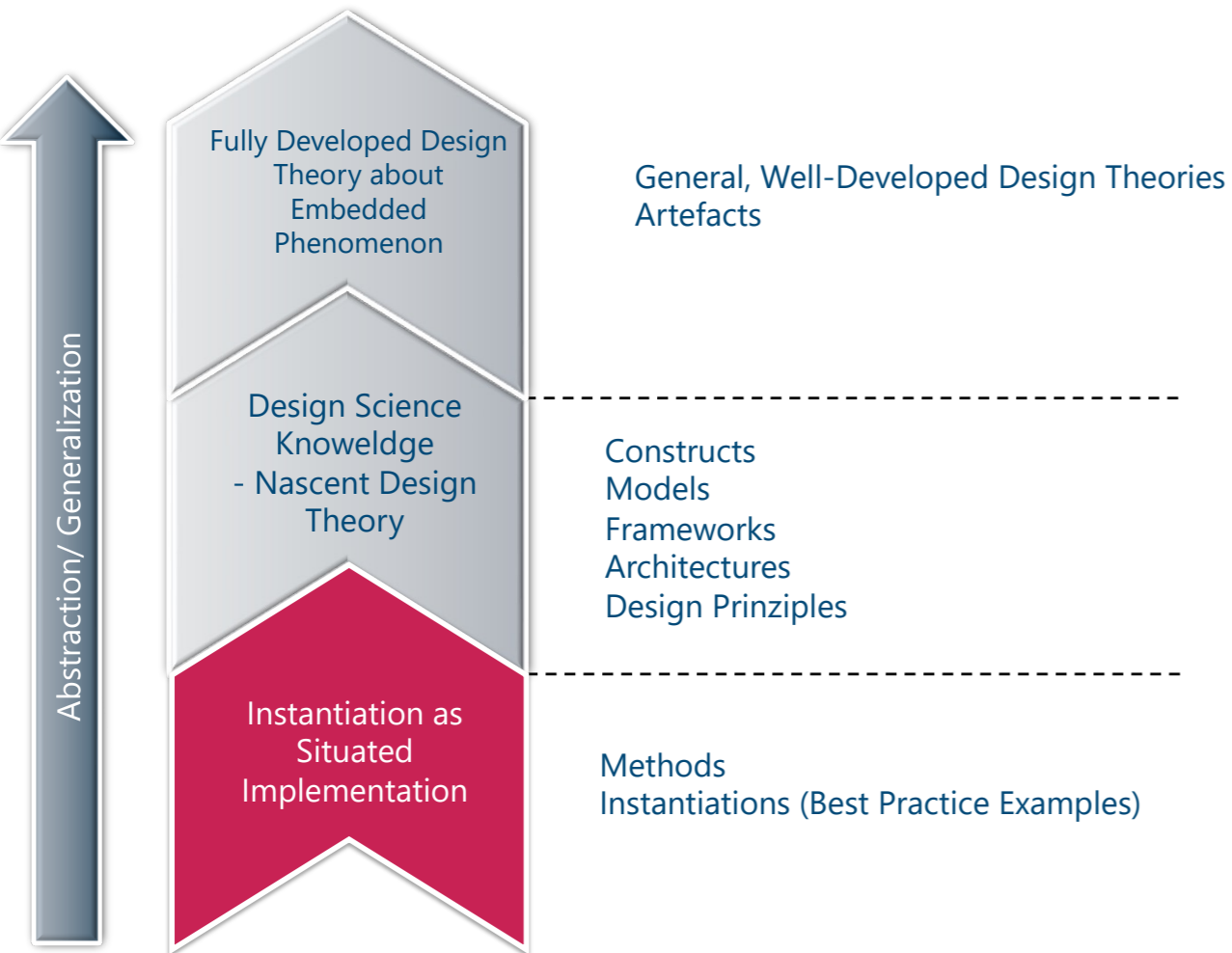
Nagulendra & Vassileva (2014)



Project „PrimaSearch“ (Uni Saarland, TH Ingolstadt, DLR_School_Labs)

Where are we now and what happens next?

Current developments



Cf. Puroo (2002); Vaishnavi et al. (2019)



[https://de.wikiversity.org/wiki/OpenSource4School/Lernumgebung en zur Informatischen Bildung im Mathematikunterricht der Primarstufe#Search Engine Literacy](https://de.wikiversity.org/wiki/OpenSource4School/Lernumgebung_en_zur_Informatischen_Bildung_im_Mathematikunterricht_der_Primarstufe#Search_Engine_Literacy)

Platz (2020)



Search Engine Literacy [Bearbeiten]

Funktionsweise einer Suchmaschine [Bearbeiten]

Entwickler der Lernumgebung: Sarah Becker, Jessica Masuhr, Julia Huppert, Isabelle Diagne-Schmidt, Katrin Kirsch

Kurzfassung: In dieser Lernumgebung übernehmen die Lernenden die Rolle einer Suchmaschine und untersuchen den Umgang mit dieser. Zur Motivierung und thematischen Einbettung wurde ein Weihnachtskontext gewählt. Der Chef einer Spielzeugfabrik muss ein passendes Weihnachtsgeschenk für ein Kind namens Kim finden. Dazu möchte er die Suchmaschine nutzen. Allerdings weiß er nicht, wie man am besten nach einem Geschenk sucht. Zunächst erkennen die Lernenden die Notwendigkeit einer exakten Suche und die Notwendigkeit der Sortierung von Ergebnissen. Anschließend sollen sie die Arbeit der sogenannten Crawler übernehmen, indem sie eine Menge an Gegenständen sortieren. In einem anschließenden Rollenspiel bestellen sie an einem Schalter, der die Suchmaschine darstellt, verschiedene Gegenstände. Dazu müssen sie mit drei Wörtern ihren Gegenstand so genau beschreiben, damit sie das entsprechende Gegenstück erhalten. So erkennen sie, wie man am besten nach Ergebnissen im Internet sucht. Dazu werden gemeinsam Guidelines formuliert, die die Lernenden auf einem Arbeitsblatt festhalten. Zum Abschluss zeigt ein Video, wie eine Suchmaschine funktioniert. Dabei können die Lernenden Bezüge zu ihrem eigenen Vorgehen in der Unterrichtsstunde herstellen.

OpenSource4School/Lernumgebungen_zur_Informatischen_Bildung_im_Mathematikunterricht_der_Primarstufe/Funktionsweise_einer_Suchmaschine

Personalisiertes Ranking [Bearbeiten]

Entwickler der Lernumgebung:Paulina Albrecht, Marie Jochum und Luisa Braun

Kurzfassung:

OpenSource4School/Lernumgebungen_zur_Informatischen_Bildung_im_Mathematikunterricht_der_Primarstufe/Personalisiertes_Ranking

Einstieg in die Arbeit mit Suchmaschinen und Personalisierung [Bearbeiten]

Entwickler der Lernumgebung: Talisa Grießner, Selina Nickel

Kurzfassung: In dieser Lernumgebung sollen die Lernenden die Funktionsweise einer Suchmaschine und damit einhergehend die Personalisierung verstehen, indem sie spielerisch einzelne Funktionen der Suchmaschine selbst ausführen. Darüber hinaus wird mit Tablets, also mit digitalen Medien, gearbeitet, wodurch einerseits der Alltag der Kinder miteinbezogen wird und andererseits ihre digitalen Kompetenzen geschult werden. Zusätzlich wirkt der Einsatz der digitalen Medien motivierend auf die Kinder. Außerdem wird in der Lernumgebung vor allem die Kompetenz des Begründens gefördert, welche in vielen Lebensbereichen benötigt wird. Durch die Durchführung der einzelnen Funktionen der Suchmaschine lernen die Schülerinnen und Schüler außerdem, wie ihre Suchergebnisse zustande kommen. Zusätzlich erfahren sie, dass die Suchmaschine Daten über sie sammelt, was zu einem vorsichtigen Umgang mit dem Internet anmieren soll.

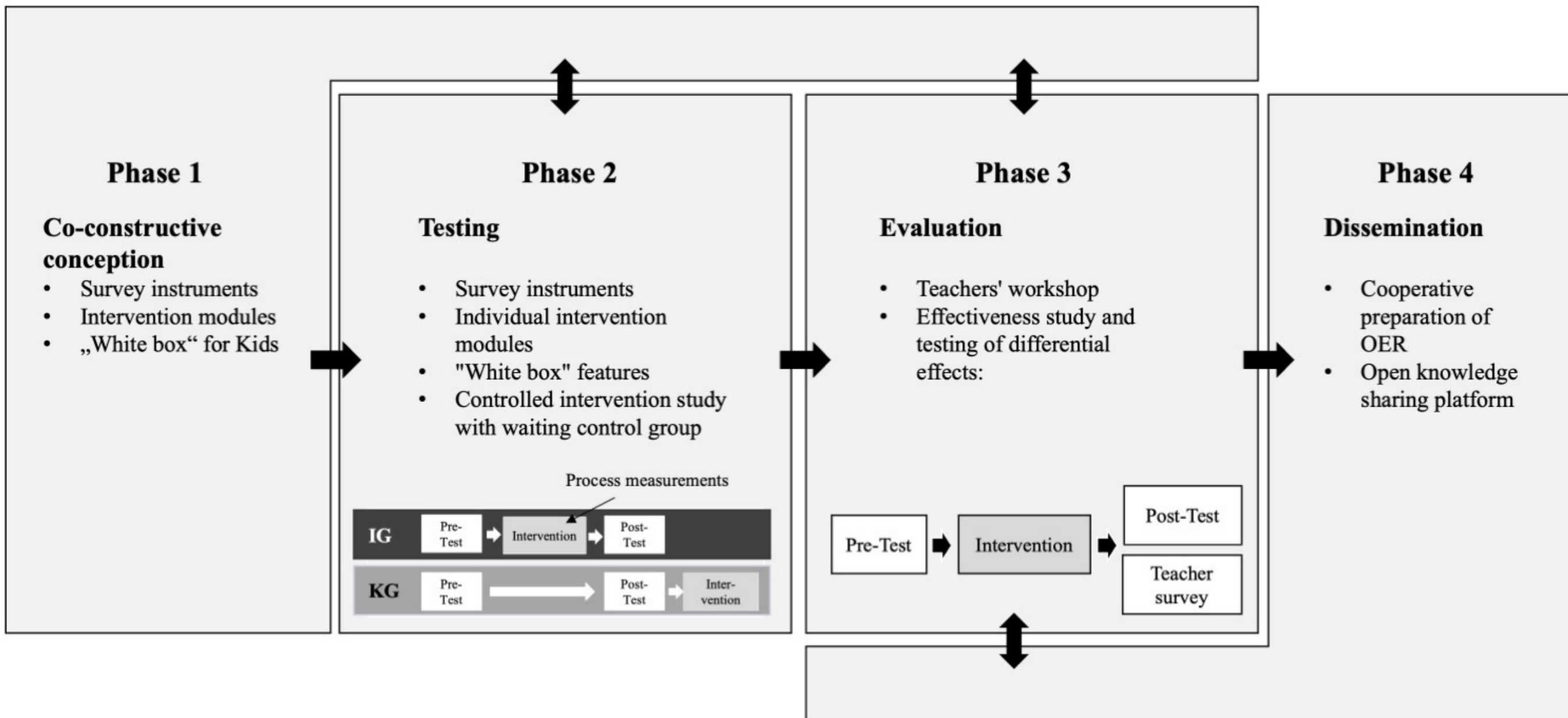
OpenSource4School/Lernumgebungen_zur_Informatischen_Bildung_im_Mathematikunterricht_der_Primarstufe/Einstieg_in_die_Arbeit_mit_Suchmaschinen_und_Personalisierung

Algorithmen [Bearbeiten]

Entwickler der Lernumgebung: Lara Nehren, Julia Palermo

Kurzfassung: Die SuS sollen verstehen, dass Algorithmen nicht nur ein komplexes und schwer begreifbares Phänomen aus der Welt der Computer etc. sind, sondern, dass ganz alltägliche Situationen ebenso von Algorithmen durchzogen sind. Somit sollen Berührungspunkte der SuS mit der Thematik vorgebeugt werden, sodass eine Offenheit dafür erzeugt wird. Dies ist insbesondere deshalb von großer Bedeutung, da in naher Zukunft Algorithmen wichtiger denn je sein werden. Durch ein früh (im Grundschulalter) allgemein gewecktes Interesse, wird zudem die Wahrscheinlichkeit vergrößert, dass die Kinder in Erwägung ziehen, später einen in den Bereich der Informatik

Project phases



Project „PrimaSearch“ (Uni Saarland, TH Ingolstadt, DLR_School_Labs)

Thank you
for your attention!



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Friederike.Klan@dlr.de

Alexander.Decker@thi.de



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