

# Information Problem Solving

Unraveling involved processes and designing instruction

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# Information problem solving

- **Skills, knowledge and attitude to**
  - define the information need;
  - identify sources;
  - judge and select relevant information from the sources;
  - organize the information found;
  - present the information into a coherent product;
  - construct knowledge.



# Unraveling the IPS-process

Feddes, R., Vermetten, Y., Brand-Gruwel, S., & Wopereis, I. (2003). Strategische kennis over het oplossen van informatieproblemen: een exploratief onderzoek [Strategic knowledge about information problem solving: an explorative study]. *Pedagogische Studiën*, *80*, 210-225.

**Brand-Gruwel, S., Wopereis, I., & Vermetten, Y. (2005). Information problem solving by experts and novices: analysis of a complex cognitive skill. *Computers in Human Behaviour*, *21*, 487-508.**

Brand-Gruwel, S., Wopereis, I., & Walraven, A. (2009). A descriptive model of Information Problem Solving while using Internet. *Computers & Education*, *53*, 1207-1217.

Argelagos, E., Brand-Gruwel, S., Jardozi, H., & Pifarre, M. (2014). Web search processes: how to measure them? An exploratory study comparing methods. Manuscript in submitted.

# Participants: expert-novice study

- **Experts:**
  - 5 PhD students in the field of Educational Technology in their final year
- **Novices:**
  - 5 Psychology freshmen from the University of Maastricht



# Set up: expert-novice study

## Task:

write in 90 minutes an article for a consumers magazine ( $\pm$  400 words) about food that is out of date

## Instrument to analyze the thinking aloud protocols:

- main skills
- sub skills
- regulation

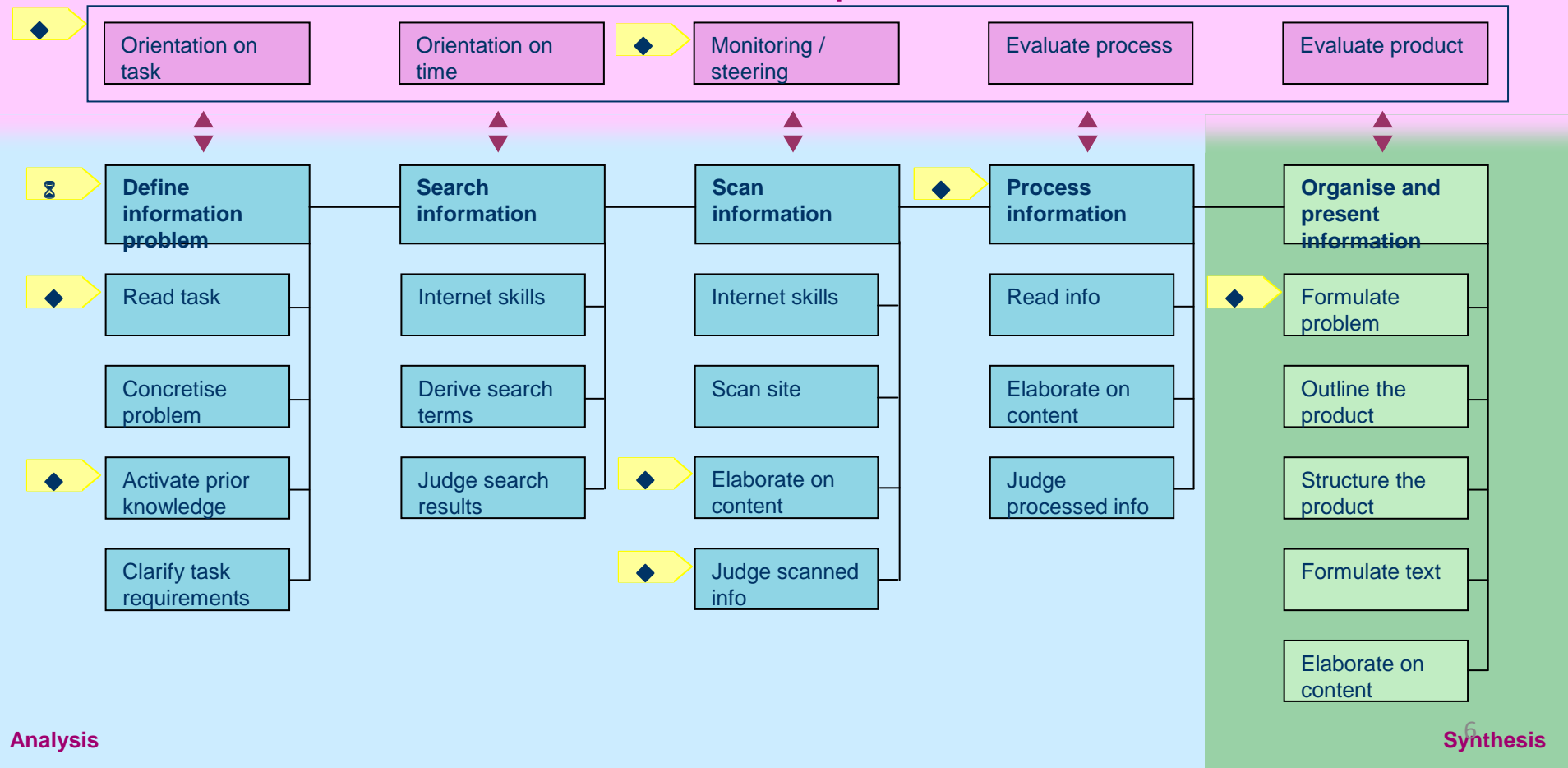


# Information Problem Solving

## a skill decomposition

Regulation

Regulation



# Process of evaluating

**Walraven, A., Brand-Gruwel, S., & Boshuizen, H.P.A. (2009). How students evaluate information and sources when searching the World Wide Web for information. *Computers and Education*, 52(1), 234-246.**

Walraven, A., Brand-Gruwel, S., & Boshuizen, H.P.A. (2011). Teachers and the World Wide Web: How teachers evaluate search results, information and source. Manuscript submitted for publication.

Brand-Gruwel, S., & Stadtler, M. (2011). Solving Information-based Problems: Searching, Selecting and Evaluating Information. *Learning and Instruction*, 21, 175-179.

# Set up: evaluation behavior study

- Participants: 23 students from secondary education
- Tasks: 12 tasks: 4 science / 4 geo. / 4 language
  - example: Young people use MSN and SMS a lot. Does this have an influence on their language proficiency?
- Procedure: each student accomplished 2 tasks while thinking aloud (30 per task)





# Results: evaluation behavior study

- Students do not evaluate in a sophisticated way
- Sources are hardly evaluated on usability and reliability
- Information is being judged on the connection to the task, the amount of information and the language



# Evaluation and role of prior knowledge

**Brand-Gruwel, S., Kammerer, Y., Van Meeuwen, L., & Van Gog, T. (2014).**  
**The use of evaluation criteria when searching the WWW. *Manuscript in progress***



# Evaluation and role of prior knowledge

Participants:

- 20 psychology students (freshmen) (12 men and 8 women; age  $M = 20.2$ ,  $SD = 4.07$ )
- 17 psychology teachers (University) (7 men and 10 women; age  $M = 39.5$ ,  $SD = 12.33$ )

Task:

- Two tasks (reliability of human memory and altruism)
- Each task had a Google-like result page (SERP) with 17 links
- select and prioritize information and rank the best five sites (10 minutes)

# Eye-movements

Het Internet [Afbeeldingen](#) [Maps](#) [Nieuws](#) [Video](#) [Gmail](#) [meer](#) [Aanme](#)

**Google**   [Geavanceerd zoeken](#)  
[Voorkeuren](#)

Doorzoek:  het Internet  pagina's in het Nederlands  pagina's uit Nederland

**Het Internet** Resultaten 1 - 10 van circa 1.900.000 voor **klimaat nederland** (0,25 seconden)

**Nederland** - Wikipedia  
Nederland heeft een gematigd zeeklimaat met milde winters en koele zomers. Het klimaat wordt beïnvloed door de aanliggende Noordzee die het gehele jaar de ...  
nl.wikipedia.org - 137k - [In cache](#) - [Gelijkwaardige pagina's](#)

**Klimaat van Nederland**  
KNMI: Klimaat van Nederland - NLweer.com het dagelijks weer en het klimaat in Nederland van 1901 - Klimaatportaal van het PCCC - KMI - Klimaat ...  
nl.wikiweertje.nl - 31k - [In cache](#) - [Gelijkwaardige pagina's](#)

**Het weer & klimaat in Nederland**  
concrete klimaatgegevens voor Nederland, El Niño & La Niña, Extreem weer, ijsheligen, klimaat, midden van het land, neerslag in Nederland, noordkust, ...  
home.planet.nl - 92k - [In cache](#) - [Gelijkwaardige pagina's](#)

**Het klimaat van Nederland**  
Het klimaat in Nederland valt onder het Cf klimaat wat inhoud dat het een gematigd regenrijk klimaat is, zonder een uitgesproken droge tijd. ...  
home.hetnet.nl - 17k - [In cache](#) - [Gelijkwaardige pagina's](#)

**KNMI: Klimaat van Nederland**  
Klimaat van Nederland. Het weer is in Nederland vaak onderwerp van gesprek. Dat is niet verwonderlijk, immers in Nederland is het weer bijzonder ...  
www.knmi.nl - 19k - [In cache](#) - [Gelijkwaardige pagina's](#)

**De website van het KNMI**  
Weer, klimaat en seismologie. Nieuws, vragen, webcams, verwachtingen en waarschuwingen.  
www.knmi.nl - 34k - [In cache](#) - [Gelijkwaardige pagina's](#)  
[ [Meer resultaten van www.knmi.nl](#) ]

**Deltawerken - Het klimaat in Nederland**  
Nederland bezit een gematigd regenklimaat, Cfb volgens de indeling van Köppen. Het klimaat in Nederland wordt vooral bepaald door de ligging aan zee. ...  
www.deltawerken.com - 7k - [In cache](#) - [Gelijkwaardige pagina's](#)

Gesponsorde Koppelingen

**Weer Nederland**  
Selecteer het land of de stad en bekijk gratis het weerbericht.  
[www.google.nl](#)

**Klimaat Nederland**  
Nu: **Klimaat Nederland**  
Inclusief Montage & BTW v.a. € 10!  
[www.Airco-Unie.nl](#)

**Klimaat nederland**  
Aanbiedingen, reiservaringen, info. Alles over **Nederland**. Ontdek zelf [www.pagango.nl/Nederland](#)

[Uw bericht hier?](#)



# Results: evaluation and prior knowledge

- The domain experts do evaluate the reliability of the sites significantly more often than the novices
- The novices used more superficial criteria for evaluation (statements like: this seems ok, or that may be useful)
- The selected sites of the experts were of a higher quality and a relation with the use of sophisticated criteria



# Conflicting information and prior attitude

Van Strien, J., Brand-Gruwel, S., & Boshuizen, H. P. A. (in press). Dealing With Conflicting Information From Multiple Nonlinear Texts: Effects of Prior Attitudes. *Computer in Human Behavior*.



# Set up: participants and task

- 63 students (31 girls, 32 boys); secondary pre-university education
- Reading materials: 1 neutral text introducing videogames, 6 texts in favour and 6 texts arguing against violent videogames
- Task: write essay of 300 to 500 words on the relationship between violent videogames and aggressive behaviour
- Prior attitude: 6-item questionnaire to assess attitudes
- Coding essays: borrowed, added, transformed / neutral, positive, negative (slightly or strongly biased)

# Results: effect of prior attitude

- Participants with more pronounced prior attitudes:
  - were more likely to write essays that were strongly biased or at least leaning toward one side of the debate
  - were more likely to adopt a positive position in their essays.
  - prior attitude was positively associated with the proportions of added content
- Participants with more neutral prior attitudes.
  - were more likely to acknowledge the inconclusive nature of the topic in their essays,
  - essays also included more borrowed information, and less added information.



# IPS and instructional design

Brand-Gruwel, S., & Gerjets, P. (2008). Instructional Support for Enhancing Students' Information Problem Solving Ability. *Computers in Human Behavior*, 24, 615-622.

**Walraven, A., Brand-Gruwel, S., & Boshuizen, H. P. A. (2010). Fostering transfer of web searchers' evaluation skills: A field test of two transfer theories. *Computers in Human Behavior*, 26, 716-728.**

Wopereis, I., Brand-Gruwel, S., & Vermetten, Y. (2008). The effect of embedded instruction on solving information problems. *Computers in Human Behavior*.24, 738-752.



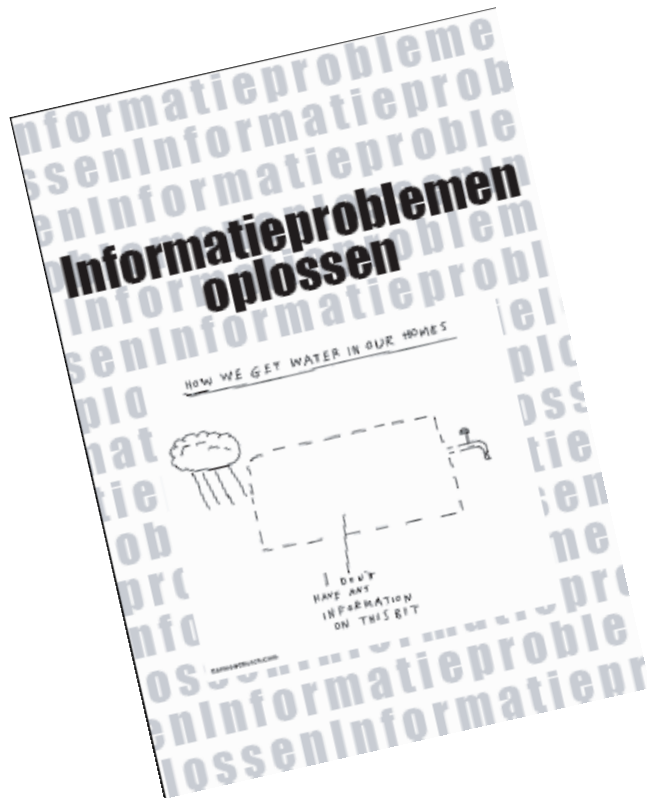
# Embedded instruction

- Setting:
  - 15 lessons
  - IPS embedded in history class
  - Focus on evaluation of sources and information
- Tasks:
  - Role play: Treaty of Versailles
  - Cartoon about Hitler
  - Game in with events had to be set in chronological order

# Process worksheets

<b>Address</b>	<b>Judgement</b>	<b>Use?</b>
<b>Example</b> <a href="http://members.lycos.nl/oorlogstijd/index.html">http://members.lycos.nl/oorlogstijd/index.html</a>	This is a private site of an 18 year old girl. Not that much text. No references. Not reliable. Author is not a known person.	No

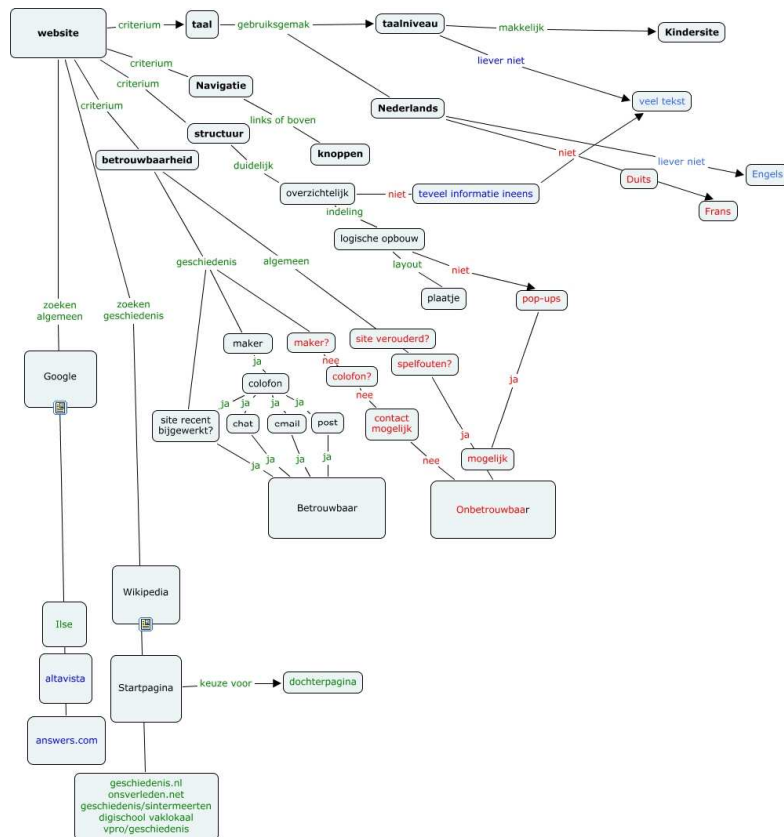
# Supportive information



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# Mindmap and discussion



# Results of embedded instruction

- Students become more critical regarding the evaluation of web sites
  - More use of criteria like:
    - Author
    - Organization behind the site
    - Type of site ....
- Students of the experimental condition performed significantly better on the history exam than the students of the control condition