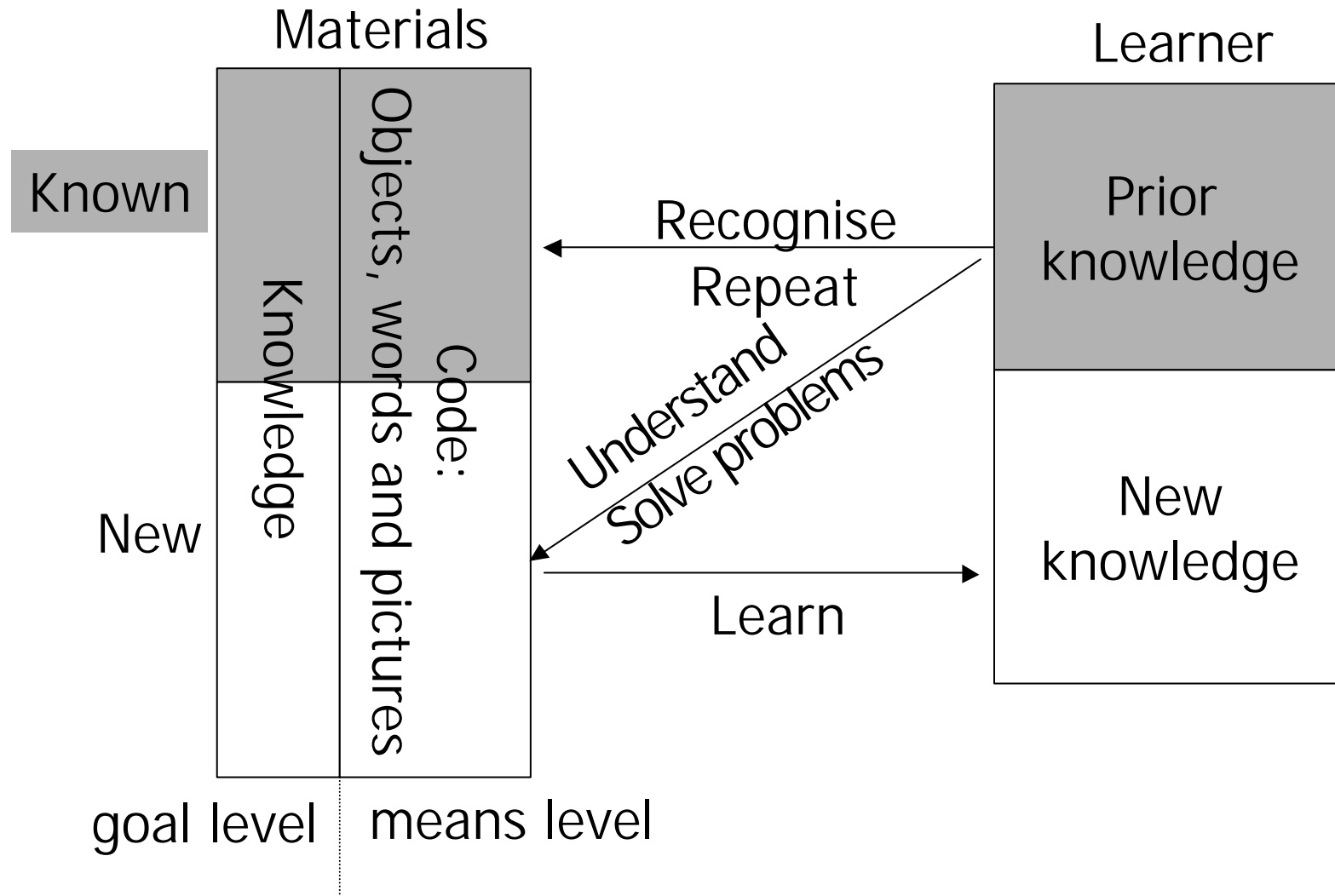


Discussion:
Cognitive load theory, a bridge
between learning and instruction

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Cognitive load and learning

Processing materials involve cognitive load that can interfere with learning



Cognitive load and instructional design

- Reducing the cognitive load involved in processing the material makes learning possible or easier
- How? By ...
 - reducing the goal specificity effect
 - using worked examples & completion problems
 - integrating information sources
 - adding redundancy
 - mixing visual and auditory modes
 - varying practices

Challenges and problems with cognitive load theory

- Learner's level of expertise
- Relationships between (useless) mental effort, (usefull) deep processing, and learning
- Subjective and objective measures
- Different learning situations
- Relevance and redundancy
- Subject's strategies and compensatory effects

1.

What did we learn today?
What are the contributions
to cognitive load theory?

Using worked examples & completion problems

- Fading procedure (from completing examples to problem solving) fosters learning (Renkl & Atkinson)
- Fading procedure with self-explanation prompting procedure fosters learning (Renkl & Atkinson)
- Worked examples are not effective for experienced learners (Sweller, Kalyuga & Chandler)

Integrating information sources

- Integrating explanations into an example increases learning (Atkinson & Renkl)
- Integrated formats are not effective for experienced learners (Sweller, Kalyuga & Chandler)

Mixing visual and auditory modes

- Replication of the modality effect in multimedia learning (Brünken & Leutner)
- No effect on picture comprehension but on text comprehension (Brünken & Leutner)
- Replacing text with audio is only effective when multimedia instructions are system-paced (Tabbers, Martens & van Merriënboer) ≠ the modality effect is improved by learner controlled presentation time (Brünken & Leutner)

... and more

- The presentation of background information during practice is superior to presentation before practice (Kester, Kirschner & van Merriënboer)

2.

Which challenges have been met? Which problems have been solved today?

Different learning situations

- The modality effect can be replicated with longer multimedia instruction on a non-technical subject (Tabbers, Martens & van Merriënboer)

Subject's strategies and compensatory effects

- Cognitive load effects can be partially compensated by adaptive learner strategies (Gerjets, Scheiter & Tack)

Subjective and objective measures

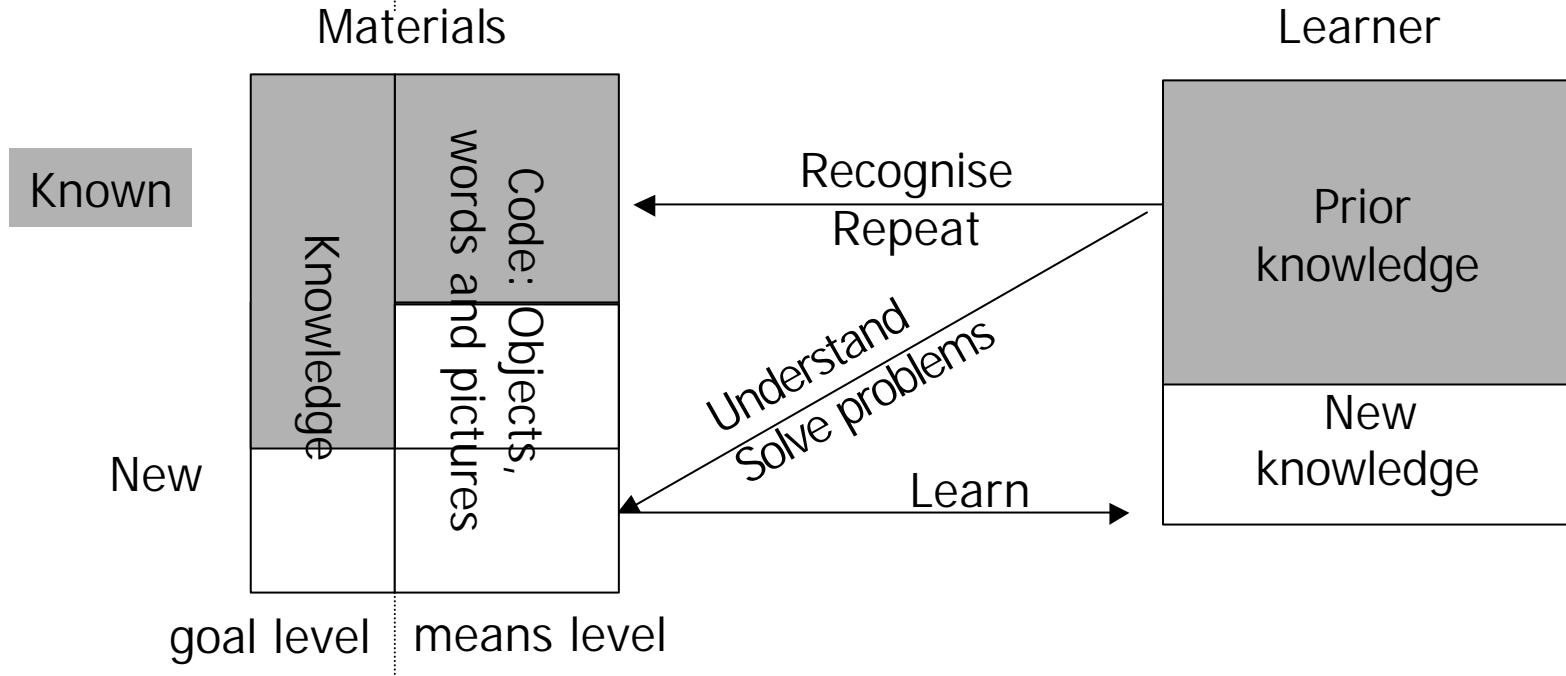
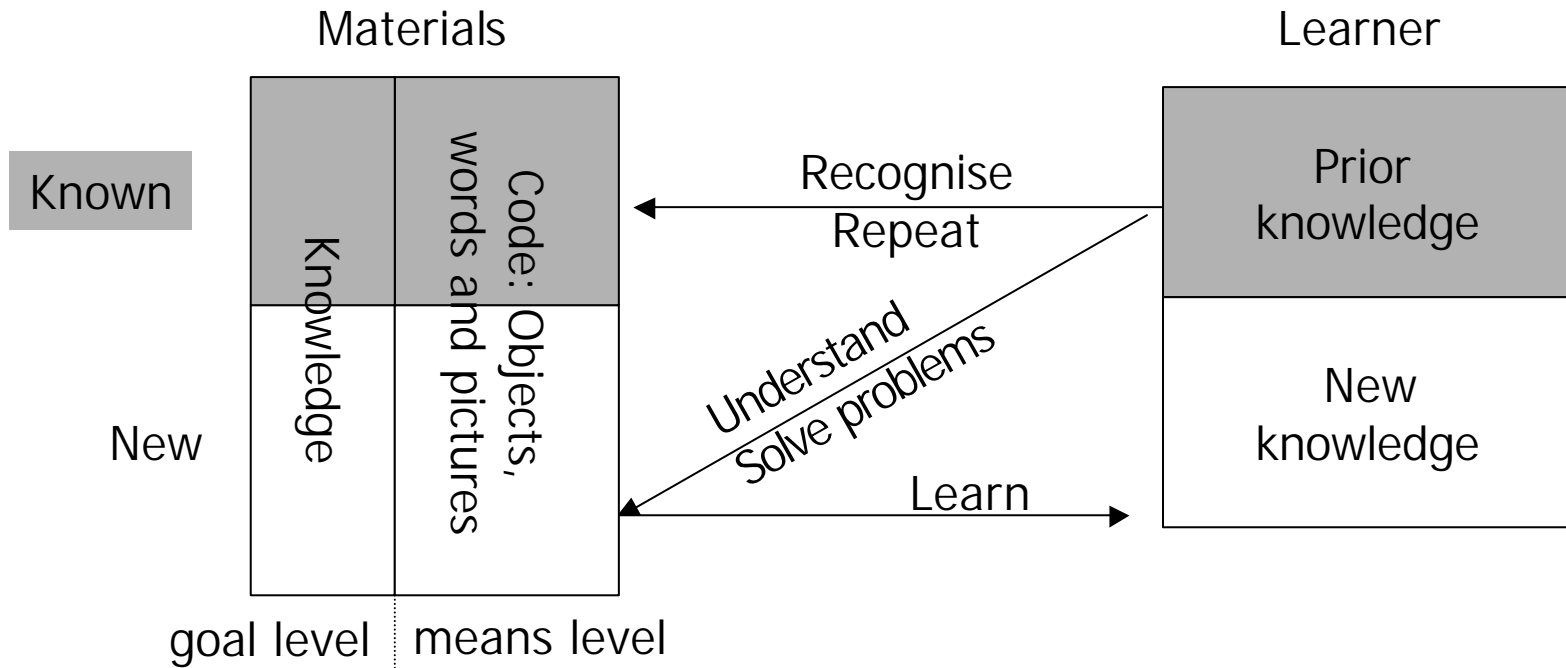
- Eye tracking provides rich information about learner's attention, it can be used as an indice of cognitive load, for example in the split attention effect (Paas & Tabbers)

Learner's level of expertise

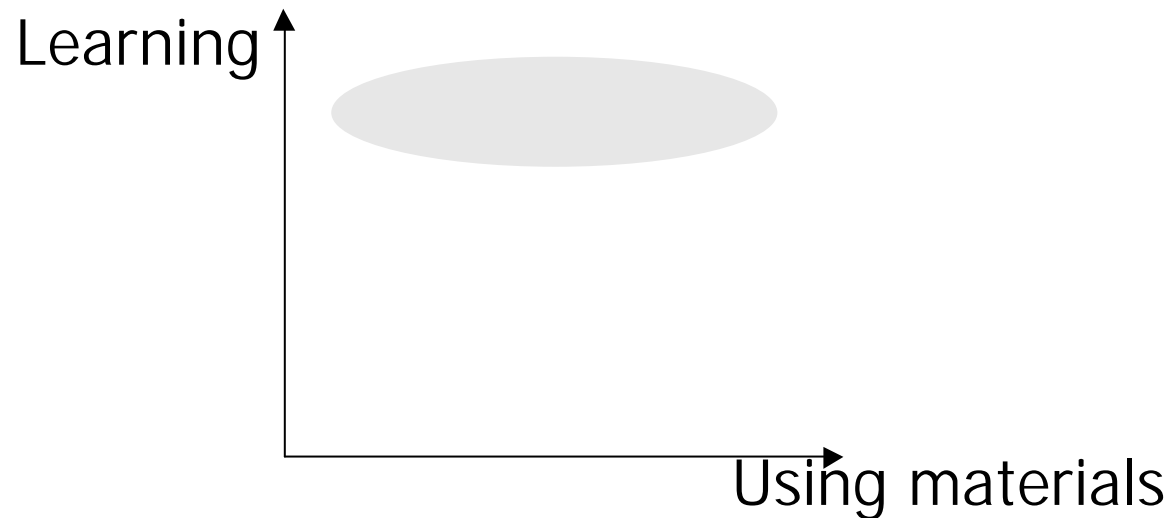
- Worked examples can be replaced by problems as expertise increases (Renkl & Atkinson)
- The expertise reversal effect: several, maybe all, cognitive load effects disappear with increasing learner knowledge (Sweller, Kalyuga & Chandler)

3.

Conclusions and perspectives



- A general framework describing the causal links between learning means and learning goals should be elaborated
 - To interpret a result we must know if the material is necessary to learn



A learning and instruction theory should be elaborated as a relevance theory. Instructional design is the design of relevant materials, *i.e.* the design of information as a function of a learning goal and the learner's previous knowledge, where and when this information is needed