



# The impact of illustrations and warnings on solving mathematical word problems realistically

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## Introduction

- Elementary school pupils are accustomed to standard word problems (S-items).
- Due to repeatedly being confronted with this kind of problems, pupils approach them in a routine and artificial way.
- When pupils are confronted with problematic problems (P-items) they solve them incorrectly;
- They simply perform the arithmetic operations with the given numbers, without taking into account the described reality.

→ **S-items**= Problems that can be solved correctly by the application of straightforward operations with the given numbers.

→ **P-items**= Problems that require realistic thinking.

## The present Study

→ The goal of the present study is to investigate whether an illustration and/or a warning could help pupils to build a situational model of the problem situation and, consequently solve the P-items more realistically.

## Hypothesis

→ Illustrations would positively affect the number of realistic reactions (RRs) on P-items in upper elementary school pupils, especially when accompanied by a warning.

## Results Study 1

- 12.6% Realistic Reactions (RRs)
- No main effect of illustration
- No main effect of warning
- A significant interaction between illustration and warning;
  - pupils who received the items with an illustration and/or a warning produced more RRs than pupils who did not get an illustration or warning

## Conclusion and Discussion

→ Neither the presence of the illustrations, nor the presence of a warning and even not the combination of the two manipulations resulted in a statistically significant increase in the number of RRs.

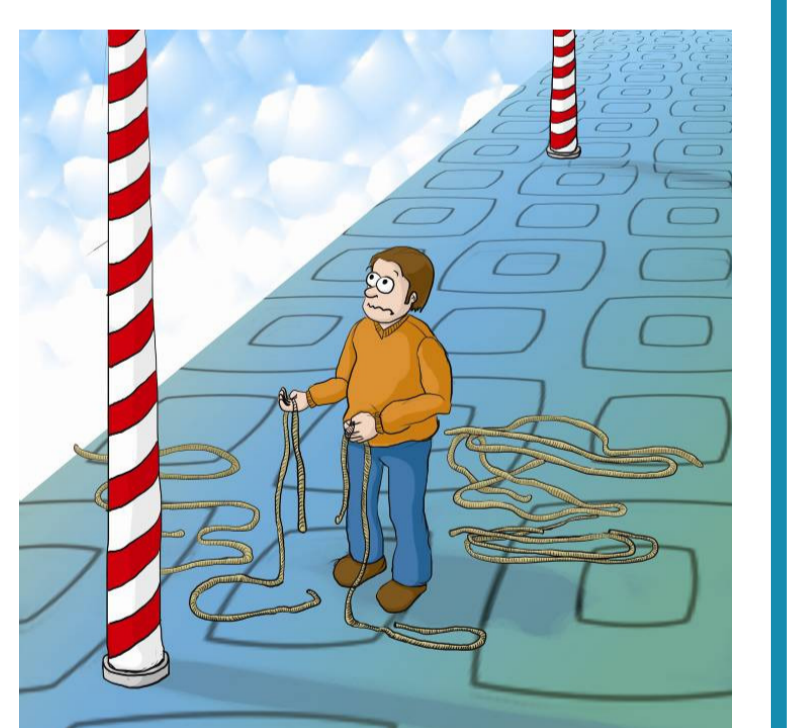
→ The results provide further empirical evidence for the very strong and persistent nature of traditionally schooled pupils' tendency to approach and handle school word problems in a non-realistic way.

## Method

- Two similar studies
  - > Study 1: Turkey
  - > Study 2: Belgium
- Elementary school pupils (age 10-11years)
  - > Study 1: 402 Turkish pupils
  - > Study 2: 233 Belgian pupils
- Paper-and-pencil test
- 20 word problems:
  - > 10 S-items
  - > 10 P-items
- Individually
- Administered by the class teacher
- Four conditions:
  - > With only an illustration
  - > With only a warning
  - > With an illustration and a warning
  - > Without an illustration or a warning

## Example (P-item)

A man wants to have a rope long enough to stretch between two poles 12m apart, but he has only pieces of rope 1.5m long. How many of these pieces would he need to tie together to stretch between the poles?



## Results Study 2

- 11.9% Realistic Reactions (RRs)
- No main effect of illustration
- No main effect of warning
- No interaction between illustration and warning
- A significant effect of pupils' general mathematical achievement;
  - higher achieving pupils gave more RRs than lower achievers
- But no interaction between illustration and/or warning and pupils' mathematical achievement