The Importance of Explanations in Guided Science Activities

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Background

Naïve misconceptions interfere with children's ability to learn science concepts.[1]

Both anomalous evidence[2] and conceptual explanations[3] can highlight the discrepancy between naïve theories and correct scientific theories. The integration of anomalies and explanations may be particularly effective for learning.

- This study addressed the common misconception that heavy objects fall faster than light ones.[4]

Research Questions

1. Does the integration of conceptual information in a guided science activity influence learning outcomes?

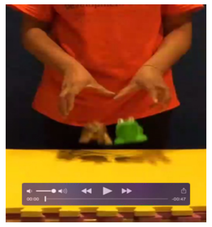
2. If YES, does this effect last over time?

Methods

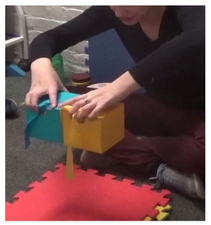
Participants : 80 5-year-olds

Guided Science Activities:

Film and Drop



Fill and Drop



Free Fall Task:

Test Question: "Will one of the objects fall faster or will both objects fall at the same time? **Why?**"

Procedure

Pretest
Free Fall Task

Condition 1
Guided Activity
Children completed one guided science activity.

Condition 2
Guided Activity + Explanation
Children completed one guided science activity and heard a conceptual explanation.

Posttest
Free Fall Task

1-week Delay
Free Fall Task

Results

Coding Scheme for Free Fall Task

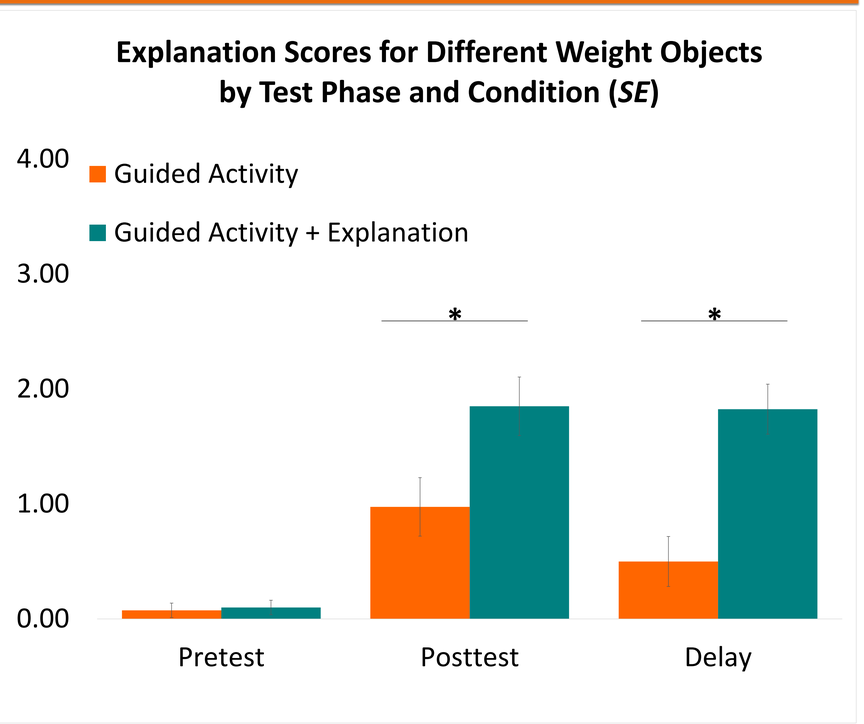
- Children's explanations were coded if children accurately predicted objects fall at the same rate.
  - Two same and two different weight objects.

Explanation Scores (Total of 4)

2	Answers referencing that objects had equal size or the force of gravity.
1	Answers combining a misconception with correct information (as above).
0	Answers referencing weight, an irrelevant variable (e.g. colour), or no explanation (e.g. I like them to fall).

ANOVA

- For different weight objects, there were main effects of test phase ($p < .001$) and condition ($p < .001$).
  - This interaction was also significant ($p < .001$).
- For same weight objects, there was only a main effect of test phase ($p < .02$).



Conclusions

The combined condition lead to greater learning outcomes at both post- and delay-tests.

Children's outcomes in the Guided Activity condition improved at post-test, but learning was reduced after a delay.

Children as young as age 5 can revise the misconception that objects of different weight fall at different rates.[3]

When children are exposed to anomalous evidence, conceptual information facilitates their belief revision.

References

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