Learning with optical Blackbox-Experiments
Focus

Learning with optical Blackbox-Experiments with emphasis on the motivational aspects.

Structure

1. Blackbox Experiments
2. Design: Survey 6\textsuperscript{th} & 8\textsuperscript{th}/9\textsuperscript{th} grade
3. Partial results – Motivation
4. Outlook: Study about Productive failures in the 6\textsuperscript{th} grade
Blackbox Experiments

- Concept: Hypothesis about the system is based on a variation of the inputs and investigation of the outputs
Design

1. Sequence of 9 boxes
   unit 1: mirror, double mirror, barrier
   unit 2: add. beam splitter
2. 2 lessons (180mins)
3. Motivational questionnaire (Mezes et al 2012)
   3.1 Interest and fun (4 Items)
   3.2 Flow (6 Items)
   3.3 Expected success (3 Items)
4. Documentation
Results: Study 1 - 6th grade

Interest and fun

- Girls attitude increases

Flow

- Girls flow experience increases

N>200; m p=1; f p=0.013

N>200; m p=0.061; f p=< 0.001
Results: Study 2 - 8th/9th grade

Interest and fun

- Girls attitude increases

\[ N>100; \ m \ p= 0.165; \ f \ p=<0.001 \]

Flow

- Boys and Girls flow experience increases

\[ N>100; \ m \ p=<0.001; \ f \ p=<0.001 \]
Comparison

- We found an unexpected gender effect.

- The surprising gap is replicable even with older students.

- Nearly same motivational developments in the age groups.

- The motivation in the 6th grade (3.84) is higher than in the 8th/9th grade (3.36).

-> Supports gender equality lessons in both age groups.
Outlook: Productive Failure in the 6th grade

Problem-solving in an unknown topic

Students fail usually

an instructional phase follows

Students solve further problems

better acquisition of conceptual knowlegde

(Kapur 2010, Loibl & Rummel 2014)

Blackboxes S01-S05 and T01-T04, mean S01-T04
THANKS FOR YOUR ATTENTION!

Literature:


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