



Teaching K-8 Children about the Internet Will Be Difficult: Preliminary Findings

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Introduction

Countries have been revamping their **primary** and **lower secondary** (K-8) computing curricula. The updated curricula also include the functioning of the **Internet**.

- **Children's** knowledge about this topic is patchy; children possess many misconceptions (reviewed in Brom et al., 2023; Babari et al., 2023).
- Less is known about internet-related knowledge of **K-8 teachers**, but it is probably not very coherent either (Lindmeier, 2020; Hallström & Klasander, 2017).
- Little is known about how to promote child understanding of this topic.

GOAL: Here, we present preliminary findings from a **mixed-method study** addressing both **pre-conceptions** of teachers and children and what children **can learn** about the topic of the internet functioning from a 45-min tutoring.

Method

- **Cross-sectional mixed-methods study**
- **Children** (Grades 4/5, 6/7, 8/9) + **naïve teachers** (primary, lower secondary)
- **Children** – three stages: examining pre-conceptions, explaining the topic to half of each child-group, re-examining child-groups and comparing acquired knowledge to knowledge of older groups (Figure 1)
 - 1st/3rd stage: an online, ~45-min semi-structured interview with drawing
 - 2nd stage: an online, ~45-min 1:1 tutoring with activating tasks
- **Teachers** – one stage: only pre-conceptions
- Examined/taught concepts include, among others:
 - wifi routers, network routers
 - wireless vs. wire connection
 - server-based storage of data on the internet
 - digital traces, and cookies
- Thematic and frequency analyses to describe pre- and post-knowledge (**on-going**)

Main results

- Pre-conceptions of children/teachers are **patchy**; misconceptions common.
- Younger children have frequently experience-based preconceptions only, including the notion of "wifi box", but lacking e.g., the idea of server-based storage – e.g., "a video is stored on a youtube channel".
- Children and teachers frequently view the internet in the terms of internet-related activities, but also as a means for interconnecting devices.
- Only the most knowledgeable children/teachers view the internet as a global network with a complex internal, but only vaguely understood, structure.
- Teachers tend to know about internet cables, but children tend to think the entire communication is wireless.
- Students and teachers **share some preconceptions**, including:
 - a satellite/tower is the only intermediary in communication (Fig. 2, 3)
 - satellites are over-represented in conceptions (Fig. 2, 4)
- Our **intervention session**:
 - promoted understanding in short term, but less so in a long term
 - five months later, only few children retained knowledge about network routers, some about servers
 - children tended to return to their prior misconceptions, many children mixed pre-ideas with acquired knowledge (i.e., synthetic models)
 - during interviews, children changed their ideas based on the context
 - children's post-understanding remained patchy



Figure 2. An example of the internet conception with satellites only.



Figure 3. An example of the internet structure with a central transmitting tower.



Figure 4. An example of a more complex, yet still incorrect, idea of the internet structure.

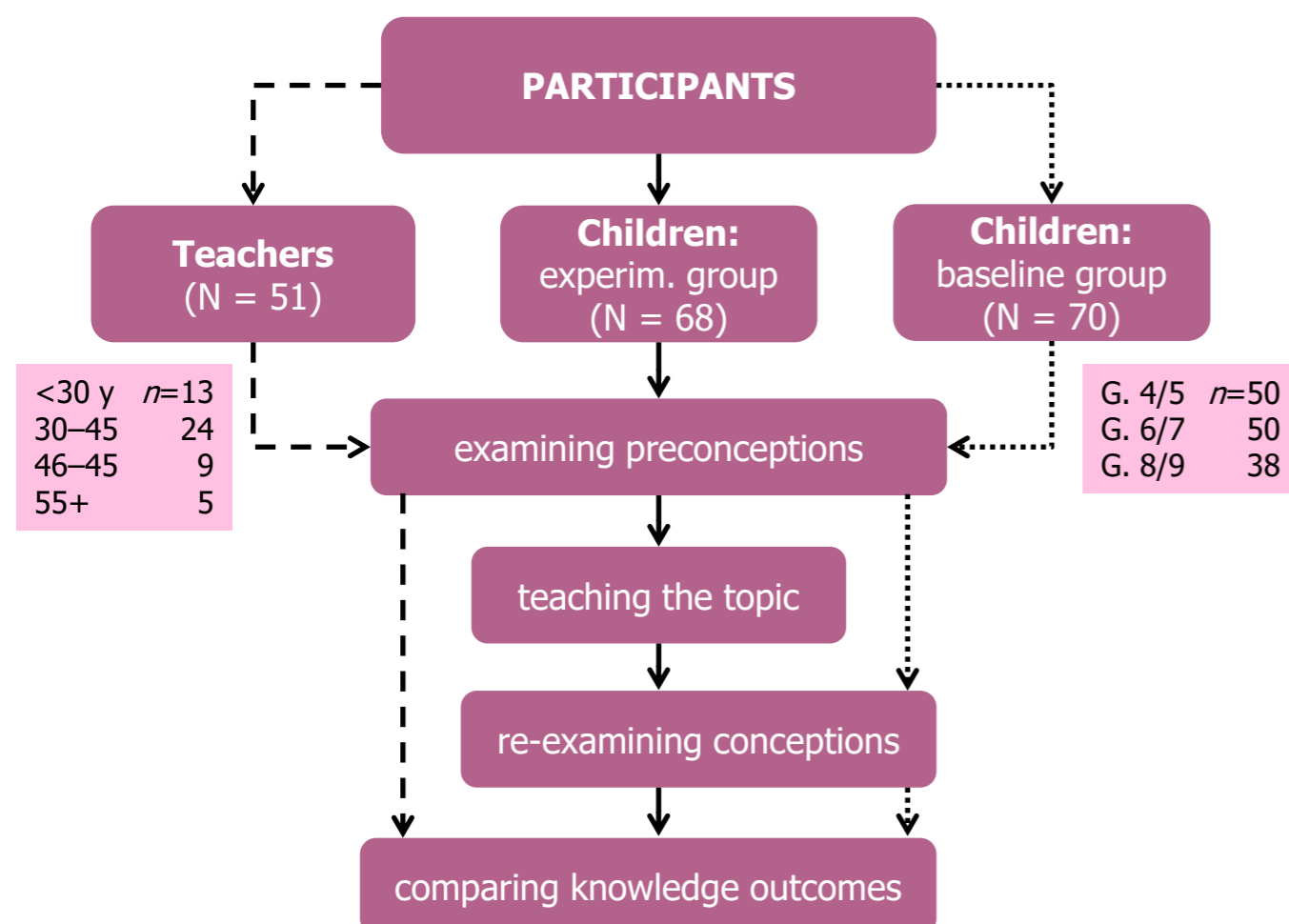


Figure 1. Overall plan of the study.

Question

- Are there any similarities with knowledge acquisition in other complex technological systems (such as electric grid or sewage systems)?

Discussion and on-going work

- Pre-conceptions we found corroborate previous literature (e.g., Brom et al., 2023)
- The findings correspond with "knowledge in pieces" conceptual change frameworks (Kapon & diSessa, 2012)
- Open question: instructional approaches to promote long-term retention
- Next step: complete the analysis

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