Activation of Background Knowledge for Inference Making: Effects on Reading Comprehension

In this experimental study, 16 sixth-grade classes (N = 236) were randomly assigned to either experimental or control conditions. In the experimental condition, student contributions to 'gap-filling' inferences with expository texts were made explicit by means of graphic models and inference-demanding questions. After 8 sessions of 30 min each, a large training effect was found on student inference-making skills with a substantial and sustained transfer effect to a standard measure of reading comprehension.

Authors: Carsten Elbro & Ida Buch-Iversen

Failure to activate relevant, existing, background knowledge may be a cause of poor reading comprehension. This failure can result in particular problems with inferences that depend heavily on prior knowledge. In this experimental study, 16 sixth-grade classes (N = 236) were randomly assigned to either

experimental or control conditions. In the experimental condition, student contributions to 'gap-filling' inferences with expository texts were made explicit through graphic models and inference-demanding questions. After 8 sessions of 30 min each, a large training effect was found on student inference-making skills with a substantial and sustained transfer effect to a standard measure of reading comprehension.

- Texts cannot be understood without contributions from readers.
- Texts provide instructions to readers about how to use relevant knowledge and experience to build an understanding of the text.
- Building an understanding depends heavily on the reader's ability to draw inferences.
- In some cases, the reader does not have the knowledge necessary to form the inferences required to comprehend a text.
- Ability to make inferences can contribute to reading comprehension, even when other abilities and knowledge are controlled (such as decoding, vocabulary, awareness of text structure, comprehension monitoring, and verbal IQ).
- Most experimental studies have aimed broadly to encourage students to reflect about texts. Further, inference making has not been taught or studied exclusively, but only as a part of a broader training programme.
- The present study focused exclusively on inferences during reading that require integration of background knowledge with information from the text to form a coherent representation of the meaning.
- The current study focused specifically on inferences that are both dependent on prior knowledge and crucial for maintaining global coherence in text comprehension.
- Identified inferences are termed 'gap-filling'

inferences.
- To elucidate the contributions from reader knowledge, graphic models were employed in a questioning format.

The present study

In the present study, Grade 6 students (aged 11 years) were selected because they face an increasing number of expository texts from which they are expected to acquire new knowledge. The study focused exclusively on knowledge-demanding and gap-filling inferences for two reasons: they are necessary for building a coherent representation of texts and they may work as an ideal showcase for the use of background knowledge.

Research questions:

1. *Does such focused training generalise across texts to similar inferences in untrained texts with no prompts to activate background knowledge?*
2. *Do primary training effects generalise to reading comprehension more broadly when measured with a standard test of reading comprehension and is the effect sustained?*
3. *Can the possible effects be mediated by student abilities prior to training?*

The present data

In this study, 16 sixth-grade classes were randomly assigned to either an experimental or a control condition. The class teachers provided voluntary participation. The experimental condition consisted of 10 classes, while the control condition comprised 6 classes (from 2 schools). In the experimental

condition, eight lessons in knowledge-based inference making replaced a similar amount of teaching of mother-tongue language and literature, whereas the control group received ordinary teaching.

The inference-training programme

- The materials for the eight training sessions consisted of short expository texts and questions that required students to make gap-filling inferences.
- In the first session, students were introduced to the programme using a mix of short narrative and expository passages (typically 2–4 sentences). After each passage, a comprehension question was asked that required students to supply background knowledge to draw simple inferences.
- In each of the subsequent 7 sessions, students read 2 or 3 short texts of 100–200 words and answered relevant inference-demanding questions.
- The training programme comprised 15 texts of expository prose written for the programme.
- Text topics were selected from biology, geography, technology, sociology, and history.
- In Sessions 2–6, all texts were supported by graphic organisers.
- The organisers had empty boxes into which the students were asked to place relevant pieces of information stated in the text or supplied from their background knowledge.
- In the final 2 sessions, students read the same kind of texts and answered knowledge-demanding inference questions about them but without the support of graphic organisers.
- All teaching in the experimental programme was provided by the ordinary class teachers during 8 sessions of approximately 30 min each.
- At the beginning of each session, teachers presented the

students with an overview of the session and explained any difficult words in the texts.

- The control group did not see any of the experimental materials and were taught ordinary mother language lessons according to national guidelines.
- All participating teachers were given a brief introduction to the aims and plan of the study.
- After teachers and classes had been randomly assigned to the experimental or the control condition, teachers in the experimental condition received a 1 hr introduction to the experimental programme.
- During the introduction, teachers were provided with all the teaching materials. This included all the student worksheets and a written step-by-step teaching manual that explained the goals and procedures of each training session.

Findings

- There were no group differences at pre-test except for a significant difference in word decoding in favour of the experimental group.
- No significant effects were found on either mathematics abilities or motivation; thus, the general expectancy effect was not supported.
- A large interaction effect (d = 0.92) was found between time and condition on inference making.
- A medium to large interaction effect (d = 0.69) was found between time and condition on reading comprehension.
- The effects for fiction and nonfiction texts were medium (d = 0.46 and 0.57, respectively).

- With regard to question types, the effect on literal question was medium (d = 0.45) whereas the effect on interpretation questions was medium to large (d = 0.73).
- With respect to improvements in inference making, results indicated that the training effect occurred during the training period and was sustained after completion of the training.
- Analogous analyses for reading comprehension provided a similar picture, though with smaller effects. The training effect occurred during the training and was sustained at follow-up.
- The results suggest that the effects of the training programme were not selectively mediated by gender, word decoding, vocabulary, nonverbal IQ, or motivation.
- The number of students per class correlated negatively with improvements in reading comprehension, indicating that smaller classes were associated with larger improvements.
- Average time per session spent on the experimental programme correlated positively with average class improvements in reading comprehension.
- However, these correlations were not backed up by similar, significant correlations with inference making.
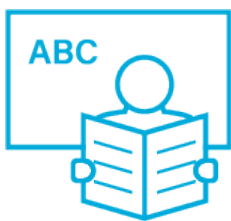
Summary

- It was possible to help 11-year-old students to improve their ability to make gap-filling inferences in a short programme of eight lessons that focused on the contribution of readers' background knowledge to text

comprehension. The training effect remained large when initial abilities in word decoding, receptive vocabulary, and verbal IQ were controlled.

- Training was also associated with a significant advance in general reading comprehension (fiction and nonfiction) and for both literal and nonliteral questions. The effect was sustained for five weeks after termination of the experimental teaching.
- The effects of the experimental training were found to be robust and independent of student characteristics and abilities assessed prior to participation in the experimental programme (gender, vocabulary, decoding fluency, and nonverbal IQ).