Crossing the boundaries

Swedish teachers' interplay with Finnish curriculum materials

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Background and aim

- There is a growing interest in applying Finnish mathematics curriculum materials in Swedish schools.
- Applying the materials to another cultural context than the original offers a fruitful setting for investigating the dynamic interplay between teachers and the applied curriculum materials.

The aim of the present study

- to develop conceptual understanding of the interplay between teachers and mathematics curriculum materials by investigating the case of Swedish teachers (Grades 1-4) working with the Finnish materials.

Theoretical stances

- Curriculum materials viewed as *cultural tools* both shaping and being shaped by the human action (Wertsch, 1998; Brown, 2009)
- By the *interplay* between teachers and mathematics curriculum materials we refer to
  - the impact of the tools on the teachers' views and actions
  - how the teachers apply the material in their practices

Context

- Many similarities between the Finnish and Swedish school systems
- Teachers in both countries are to follow quite general national curriculum guidelines.
- Curriculum materials are produced by commercial publishers and there is no national control over school materials.

Context

- Some research on Finnish and Swedish curriculum materials from various points of view
  - Most Finnish teacher guides (Grades 1-6) seem to follow a rather homogeneous cultural script concerning the suggested activities and the focus on designing specific lessons
  - On the contrary, the Swedish curriculum materials vary greatly, with no focus on designing certain kinds of mathematics lessons

(Hemmi et al., in press)

Methodology

- The data was gathered during 2009–2014 from Swedish primary teachers teaching Grades 1-4
  - teaching experience from one to 40 years
  - taking part in development projects financed by the Swedish Agency for Education or the municipality
- Teachers used Finnish material that was translated into Swedish with some minor changes for adjusting the material to follow the Swedish national guidelines

Tavoitteena on oppia

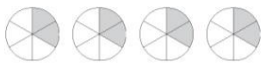
– murtoluvun kertominen luonnollisella luvulla.

Murtolukujen kertolaskua

Oppitunnilla käsitellään ensimmäistä kertaa murtoluvun kertomista luonnollisella luvulla. Tunnilla opitaan myös yksinkertaistamaan kertolaskun tulos sekaluvuksi muuntamalla ja supistamalla.

- Havainnollistetaan murtoluvun kertomista piirrosmallien avulla:

$3 \cdot \frac{1}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3 \cdot 1}{4} = \frac{3}{4}$



$4 \cdot \frac{2}{6} = \frac{2}{6} + \frac{2}{6} + \frac{2}{6} + \frac{2}{6} = \frac{4 \cdot 2}{6}$

$= \frac{8}{6} \,{}^{(2} = \frac{4}{3} = 1\frac{1}{3}$

- Todetaan, että luonnollisella luvulla kertotaan luvun osoittaja mutta ei nimittäjää.
- Kertomisen jälkeen tulo supistetaan mahdollisimman yksinkertaiseen muotoon.
- Tulo muunnetaan sekaluvuksi, jos on mahdollista.

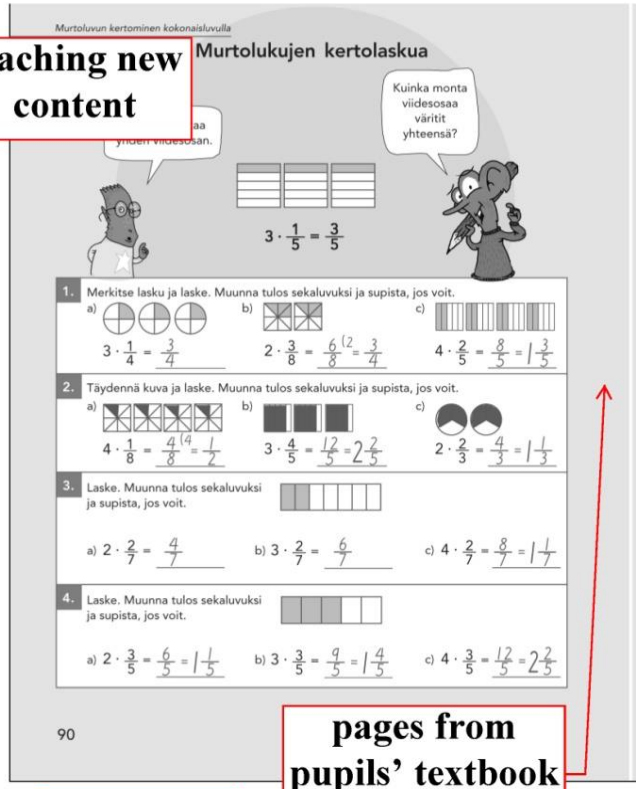
Harjoituksia

Kertopeli numerokorteilla

Oppilasparilla on kahdet numerokortit 1–10 (*oppaan liite 12*), kynä ja paperia.

Kortit ovat pakassa numeropuolet alaspäin. Kumpikin pelaaja nostaa vuorollaan kolme korttia ja muodostaa niistä murtoluvun kertolaskun (esim. $2 \cdot \frac{4}{9}$) ja laskee laskun.

Kun kaikki kortit on käytetty, ver-



Murtoluvun kertominen kokonaisluvulla

Murtolukujen kertolaskua

Kuinka monta viidesosaa väritit yhteensä?

$3 \cdot \frac{1}{5} = \frac{3}{5}$

1. Merkitse lasku ja laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $3 \cdot \frac{1}{4} = \frac{3}{4}$ b) $2 \cdot \frac{3}{8} = \frac{6}{8} \,{}^{(2} = \frac{3}{4}$ c) $4 \cdot \frac{2}{5} = \frac{8}{5} = 1\frac{3}{5}$

2. Täydennä kuva ja laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $4 \cdot \frac{1}{8} = \frac{4}{8} \,{}^{(4} = \frac{1}{2}$ b) $3 \cdot \frac{4}{5} = \frac{12}{5} = 2\frac{2}{5}$ c) $2 \cdot \frac{2}{3} = \frac{4}{3} = 1\frac{1}{3}$

3. Laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $2 \cdot \frac{2}{7} = \frac{4}{7}$ b) $3 \cdot \frac{2}{7} = \frac{6}{7}$ c) $4 \cdot \frac{2}{7} = \frac{8}{7} = 1\frac{1}{7}$

4. Laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $2 \cdot \frac{3}{5} = \frac{6}{5} = 1\frac{1}{5}$ b) $3 \cdot \frac{3}{5} = \frac{9}{5} = 1\frac{4}{5}$ c) $4 \cdot \frac{3}{5} = \frac{12}{5} = 2\frac{2}{5}$

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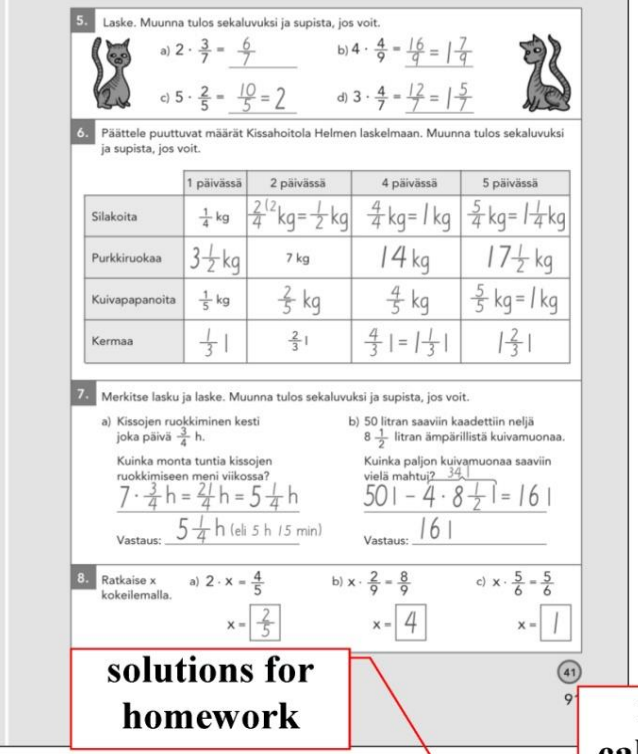
teaching new content

pages from pupils' textbook

additional exercises



5. Laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $2 \cdot \frac{3}{7} = \frac{6}{7}$ b) $4 \cdot \frac{4}{9} = \frac{16}{9} = 1\frac{7}{9}$

c) $5 \cdot \frac{2}{5} = \frac{10}{5} = 2$ d) $3 \cdot \frac{4}{7} = \frac{12}{7} = 1\frac{5}{7}$

6. Päättele puuttuvat määrät Kissahoitola Helmen laskelmaan. Muunna tulos sekaluvuksi ja supista, jos voit.

	1 päivässä	2 päivässä	4 päivässä	5 päivässä
Silakoita	$\frac{1}{4}$ kg	$\frac{2}{4} \,{}^{(2}\text{kg} = \frac{1}{2}$ kg	$\frac{4}{4}$ kg = 1 kg	$\frac{5}{4}$ kg = $1\frac{1}{4}$ kg
Purkkiruokaa	$3\frac{1}{2}$ kg	7 kg	14 kg	$17\frac{1}{2}$ kg
Kuivapapanoita	$\frac{1}{5}$ kg	$\frac{2}{5}$ kg	$\frac{4}{5}$ kg	$\frac{5}{5}$ kg = 1 kg
Kermaa	$\frac{1}{3}$ l	$\frac{2}{3}$ l	$\frac{4}{3}$ l = $1\frac{1}{3}$ l	$1\frac{2}{3}$ l

7. Merkitse lasku ja laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) Kissojen ruokkiminen kesti joka päivä $\frac{3}{4}$ h.

Kuinka monta tuntia kissojen ruokkimiseen meni viikossa?

$7 \cdot \frac{3}{4}\text{h} = \frac{21}{4}\text{h} = 5\frac{1}{4}\text{h}$

Vastaus: $5\frac{1}{4}$ h (eli 5 h 15 min)

b) 50 litran saaviin kaadettiin neljä $8\frac{1}{2}$ litran ämpärillistä kuivamuonaa.

Kuinka paljon kuivamuonaa saaviin vielä mahtui? $34 \,{}^{(1}$

$50\text{l} - 4 \cdot 8\frac{1}{2}\text{l} = 16\text{l}$

Vastaus: 16 l

8. Ratkaise x kokeilemalla.

a) $2 \cdot x = \frac{4}{5}$, $x = \frac{2}{5}$ b) $x \cdot \frac{2}{9} = \frac{8}{9}$, $x = 4$ c) $x \cdot \frac{5}{6} = \frac{5}{6}$, $x = 1$

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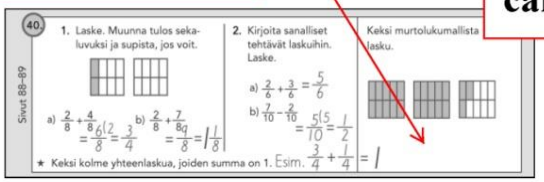
solutions for homework



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1. Laske. Muunna tulos sekaluvuksi ja supista, jos voit.

a) $\frac{2}{8} + \frac{4}{8} = \frac{6}{8} \,{}^{(2} = \frac{3}{4}$ b) $\frac{2}{8} + \frac{7}{8} = \frac{9}{8} = 1\frac{1}{8}$

2. Kirjoita sanalliset tehtävät laskuihin. Laske.

a) $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$

b) $\frac{7}{10} - \frac{2}{10} = \frac{5}{10} \,{}^{(5} = \frac{1}{2}$

Keksi murtolukumallista lasku.

★ Keksi kolme yhteenlaskua, joiden summa on 1. Esim. $\frac{3}{4} + \frac{1}{4} = 1$

Sivut 88–89

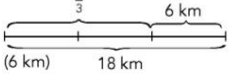
mental calculations

Pohdittavaa

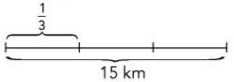
Ohjataan oppilaita käyttämään piirtämistä tehtävien ratkaisun apuna.

problem solving

1. Mikko [illegible] hän ol[illegible] joka oli 18 km. Kuinka pitkä matka Mikolla oli vielä jäljellä?

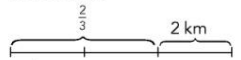


2. Riina pysähtyi sitomaan kengännauhaa, kun hän oli juossut $\frac{1}{3}$ lenkistä, joka oli 15 km. Kuinka pitkä matka Riinalla oli vielä jäljellä?



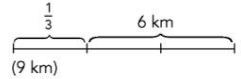
(10 km)

3. Katri oli juossut $\frac{2}{3}$ kuntolenkistään, kun hän pysähtyi juomaan. Matkaa oli vielä jäljellä 2 km. Kuinka pitkä oli Katrin kuntolenkki?



(6 km)

4. Jussi oli juossut $\frac{1}{3}$ lenkistään, kun hän pysähtyi juomaan. Lenkistä oli jäljellä vielä 6 km. Kuinka pitkä oli Jussin lenkki?



(9 km)

Päässälaskuja

1. $\frac{2}{4} + \frac{1}{4}$ $(\frac{3}{4})$
2. $\frac{5}{6} + \frac{4}{6}$ $(\frac{9}{6}$ eli $1\frac{1}{2})$
3. $\frac{3}{7} + \frac{4}{7}$ $(\frac{7}{7}$ eli 1)
4. $\frac{8}{5} - \frac{6}{5}$ $(\frac{2}{5})$
5. $\frac{8}{9} - \frac{6}{9}$ $(\frac{2}{9})$
6. $\frac{7}{10} - \frac{6}{10}$ $(\frac{1}{10})$
7. [illegible] $(\frac{6}{7})$
8. [illegible] $(\frac{8}{9})$
9. [illegible] $(\frac{6}{9}$ eli $\frac{2}{3})$
10. $\frac{3}{10} + \frac{3}{10} + \frac{3}{10}$ $(\frac{9}{10})$
11. $\frac{4}{12} + \frac{4}{12} + \frac{4}{12}$ $(\frac{12}{12}$ eli 1)

Vihkolaskuja

Laske ja muunna sekaluvuksi, jos voit.

1. $2 \cdot \frac{2}{5}$ $(\frac{4}{5})$
2. $3 \cdot \frac{2}{7}$ $(\frac{6}{7})$
3. $5 \cdot \frac{2}{3}$ $(3\frac{1}{3})$
4. $4 \cdot \frac{7}{12}$ $(2\frac{1}{3})$
5. $9 \cdot \frac{3}{4}$ $(6\frac{3}{4})$

Methodology

- Longitudinal study with various kinds of data
  - questionnaires about their work manners and relation to curriculum materials
  - interviews
  - classroom observations and video recordings of the mathematics lessons
  - documentation of collegial meetings and seminars, which the teachers attended during the project

Methodology

- In this presentation, we report the first step of an analysis of the data
  - selected data of the interviews and meetings with **eight participating teachers** during their first year of using the material

- We used an open iterative approach when analysing the data in order to find recurrent items and themes.

Results

Three main themes illuminating the interplay between teacher and curriculum materials

I. Teachers as users of curriculum materials
II. Presentation of the mathematical content
III. Organization of mathematics teaching

I. Teachers as users of curriculum materials

- Most of the teachers stated that they rely on the Finnish teacher guides more than the Swedish ones

> I've never used a teacher guide as much as now… earlier I just 'shut' it [the guide], no I won't look at this.

I. Teachers as users of curriculum materials

- Several teachers wanted to follow the materials in detail to understand the ideas of the material (norms and principles)
- The material more extensive than the teachers were accustomed to: problematic if a teacher wanted to implement everything without selection

I. Teachers as users of curriculum materials

There's so much to choose from, and there's a danger that we talk too much, I think, as I lose them [the pupils] if we have an introduction, problem-solving and so on, then you lose them, we can't have overly long introductions, it's impossible to do so much.

I. Teachers as users of curriculum materials

- Most of the teachers considered the Finnish materials to be easy to follow and clearly structured, but still they perceived this differently.
- Some experienced it as a support for professional development, whereas some experienced its structure as inhibiting their *creativity as a teacher* (cf. Ball & Cohen, 1996).

II. Presentation of the mathematical content

- Experienced teachers paid attention to **the way** mathematical content is presented as well as descriptions of the progress students are expected to make during a certain time period.

- They also paid attention to the **emphasis on different mathematical topics**
  - For example, not enough practice in basic arithmetic when using a Finnish textbook

II. Presentation of the mathematical content

- Examples of issues that teachers paid attention to
  - numberline 0-20 from the beginning of the Grade 1 (instead of 0-10)
  - ten transition during the Grade 1
  - faster progression controversial because it makes pupils' learning difficulties visible already at the Grade 1

III. Organization of mathematics teaching

Differences between school traditions with respect to the organization of teaching

- **homework sections**: homework after every lesson was a new idea for the teachers

  → problematic to let pupils to take the textbook home
- **differentiation of teaching**: a challenge to organise instruction aligned with a common aim for the whole group

Conclusion

- the interplay with a new curriculum material is influenced by teachers' earlier experiences as well as the teaching traditions of the culture where the practices are embedded
  - the three themes to be considered in further studies
- The use of the material produced in a different cultural background reveals interesting characteristics of the interplay - further research on longitudinal data in order to deepen this understanding

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