CONVERTING VIA FRACTIONS, DECIMALS, AND PERCENTS

Regina Reinup

Tallinn University

SUMMARY

The topic of percentages in the school mathematics is usually taught at the age of 12-13, i.e. in the 6th and 7th grade of secondary school. In some phases of learning this topic students must be able to understand the principles of converting from decimals to percents, from fractions to percents, from fractions to decimals, and vice versa. In this phase, many students face problems. The poster presentation will open the background of such converting and introduce some results of a study carried out in autumn 2008.

Since the 1930s, mathematics educators have been searching effective ways of teaching the topic of percents, and the methods used in teaching are: (a) the three cases, (b) equation, (c) formula, (d) unitary analysis, and (e) proportions (Parker & Leinhardt, 1995). The basis of understanding different situations in learning percentages is the three cases method (calculating a relationship, a part, or a whole), where the students must do converting from percents to decimals or to fractions (by using a decimal or a fraction as an operator in calculations), from fractions to percents (by calculating the part-whole relationship), and from decimals to percents (by expressing the relationship in percents, when the answer of part-whole calculating is given in the form of a decimal). Difficulties in converting may be caused (1) by the necessity to change from one semiotic system to another (Duval, 2006), and (2) by students' poor skills (e.g. Hallett, 2008; Moss 2005).

It is quite common that if students cannot do converting correctly, they begin to construct answers by using the numbers they see. It can be assumed that some types of converting are simpler for students than others. In order to better understand students' skills and preferences in converting, I carried out an interview with nine students (aged 13 – 14) from the 7th grade. This interview was a part of a larger study, and was carried out approximately six months after the students had learned the topic of percents.

Each student was given a paper with 9 questions or little exercises on calculating percentages, which they were asked to fill in and at the same time explain, why they gave these specific answers. The students' answers were audio recorded. One of the questions was: "Which one of these converting operations is the simplest? Do all the converting operations in the order of simplicity." The results showed that converting from percents to decimals, and vice versa, are simpler than others. Converting from fractions to percents is the most difficult, because it needs two sequential converting operations: first from fractions to decimals, and then from decimals to percents.
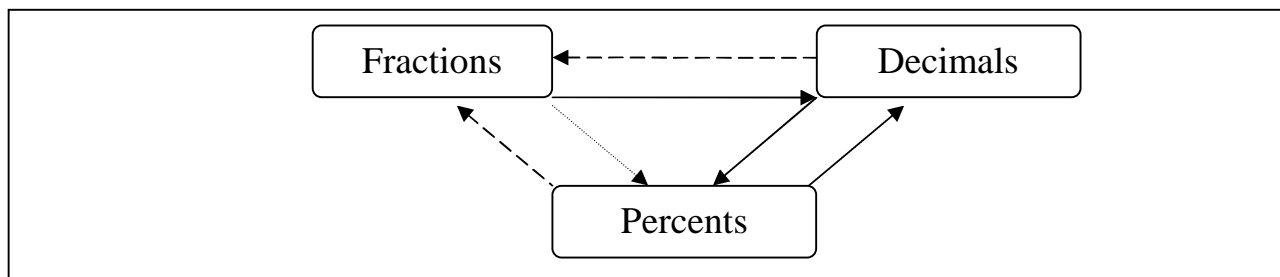
Figure 1: Strengths of different converting operations.

THE WAY OF PRESENTING

The central figure will be Figure 1, which presents the results of an empirical study, and illustrates different strengths of the skills in the converting.

There are more visual materials around this figure, e.g. data tables with (1) students' answers (right/wrong), and (2) students' preferences in converting, where the order of converting was freely chosen. Students' written answers are used as an illustrative material.

Next to visual data there will be short sections: (1) Introduction, (2) Methods, (3) Results, (4) Summary, and (5) References.

KEYWORDS

Secondary school mathematics, converting, percents

REFERENCES

Duval, R. (2006). A Cognitive Analysis of Problems of Comprehension in a Learning of Mathematics. *Educational Studies in Mathematics 61*, 103-131.

Hallett, D. (2008) Effects of Fraction Situations and Individual Differences. A review of recent research regarding children's understanding of fractions. *Report of the 11th International Congress on Mathematical Education, Topic Study Group 10. Monterrey, Mexico, July 6 - 13, 2008.*

Moss, J. (2005). Pipes, Tubes, and Beakers: New Approaches to Teaching the Rational-Number System. In M. S. Donovan & J. D. Bransford (Eds.) *How Students Learn: History, Mathematics, and Science in the Classroom,* pp. 309-350. National Academies Press, Washington, D. C.

Parker, M. & Leinhardt, G. (1995). Percent: A Privileged Proportion. *Review of Educational Research 65*(4), 421 – 481.