The **ScienceMath** project: **Proportional factor 1**
Idea: Astrid Beckmann,
University of Education Schwaebisch Gmuend, Germany

Background

General Didactic Background

Starting point is an interdisciplinary approach with science. Students shall experience Mathematics reasonable, significant and interesting by extra-mathematical references; learning in contexts shall contribute to an intuitive mathematic understanding. By means of scientific contexts and methods the often watched gap between formal maths and authentic experience shall be closed on the one hand and versatility of mathematic terms shall be experienced on the other hand.

Scientific contents offer the possibility for realistic teaching. Concrete physical or biological correlations may initiate mathematic activities and lead to authentic experiences. Mathematic contents and methods are apprehended in reasonable contexts; reality of pupils may be extended by mathematical understanding. Various realistic references lead to different models and may so contribute to distinction of conceptual attributes and of different models. The variety of scientific phenomena allow open terms of references and so self-dependent development of mathematics. Mathematic items e. g. concept of function may be experienced as modelling tools. The coherences of meanings and the differing attributes may be detected within various realistic references.

The Idea of Teaching Implementation

Basic idea of the teaching implementation is that the pupils experience the concept of the proportional factor in authentic situations and scientific contexts through experimental activities. The situations are presented at various stations. Each station contains an experiment in a proportional context. It is also possible to do the experiment together in class.

An every day impulse starts off the students to remember experiences in every day life and applied situations. They are encouraged to discuss about the behaviour of changing and to frame hypotheses. The verification of the hypothesis motivates the experiment which leads to a proportional context. This can be verified by building quotients between dependent sizes. So the proportional factor will achieve a concrete sense within the experimental context.

Mathematical Background

While teaching the 'Proportional Function' there is the danger to reduce this concept to a "line through the origin with y/x = constant". This however would be a limitation to formal, not applicable aspects which do not even record the concept correctly. It is rather the special functional dependency between the two variables or sizes that is important for the characterization of proportional functions. Explanation:

The aspects like correspondence and covariance are basic for the concept of function and the description of functional dependencies which may be described shortly by:
"Every x corresponds exactly to one y" and "if x changes, y changes also" (x and y are representative for the considered dependent sizes).

A comparison of different function types shows the characteristic of the proportional function particularly "always the same corresponding dependent change" according to figure 1 in distinction to the change in figure 2. It is important that any change Δx of x corresponds always to the same change Δy of y.

Hence:

$\frac{\Delta y}{\Delta x} = const$ The constant is called the **proportional factor.**

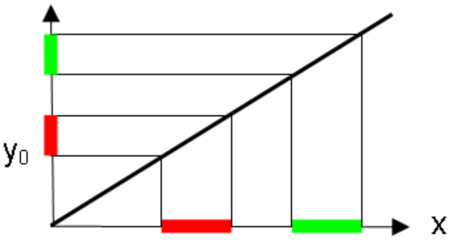

figure 1

Proportional Function with $\frac{\Delta y}{\Delta x} = const$

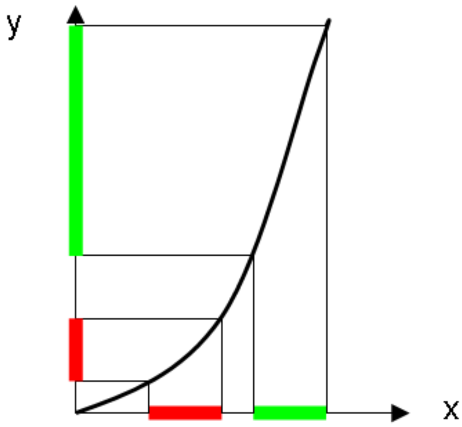

figure 2

Non-proportional Function

This project has been funded with support from the European Commission. This publication reflects the views only of the author(s), and the Commission cannot be held responsible for any use which may be made of the information contained therein.