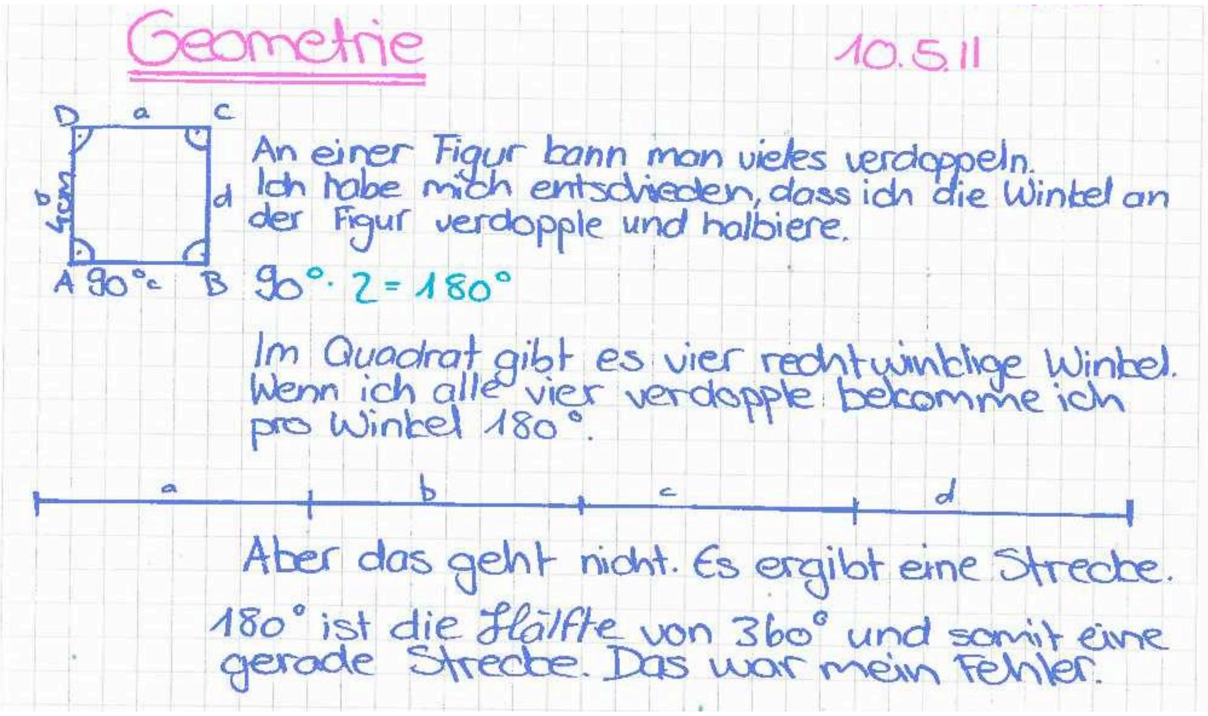
Dialogic Learning in Mathematics Classes at the Swiss Twin Centre 1

Within the framework of the German Sinus project, the University of Zurich (Switzerland) had established a sound mathematical-didactical contact with the Universities of Augsburg and Bayreuth. It was due to this relationship that Switzerland was invited to participate in the role of a TC1 within the EU's Fibonacci project. One of the Swiss centre's trademarks is the Dialogic Learning, which was developed by Urs Ruf and Peter Gallin while teaching German and mathematics at grammar school level. As university professors, they continued to underpin their discovery scientifically. Dialogic Learning is one of many possible realisations of IBSME (Inquiry-based science and mathematics education).

The goal of Fibonacci in Zurich was to familiarise a number of mathematics teachers ranging from first year primary school to the last year of grammar school with Dialogic Learning. The radical change from traditional teaching methods requires that the teacher only make a relatively small but attractive <u>offer</u> and that the students document their working in a research journal. Because the teacher sifts through all journals and discusses interesting contributions in class, especially those that build a base to further pursue the matter, the aspect of student <u>use</u> (Fend) is given adequate room. The three pillars of motivation (Deci & Ryan) – the need for autonomy, the need for social relatedness and the need for competence – are thus reinforced.

An example from classes by Markus Jetzer at a lower secondary school in Schlieren shall illustrate the fundamental difference between Dialogic Learning and a traditional approach: A common introduction to scaling (homothetic transformation) usually involves some sort of explanation how a geometric shape is transformed into another using a scaling centre and a scaling factor. Instead of this and without any further introduction, Markus Jetzer gave the students the following task: Here you see a square and a triangle. Construct shapes that are twice the size or half the size of the given shapes. What do "twice the original size" and "half the original size" mean to you ?

The entries in the students' journal could not have been wider apart from each other. An astonishing number had assumed that "twice the original size" had referred to the area, while others insisted that the lengths of the sides had been meant. This, of course, led to a highly interesting and vivid discussion during the following lesson. A most creative girl even posed the question in her journal what things could be doubled. Her initial idea, which however she had not pursued, was to double the angles. Not even a trainer in mathematical didactics could think of something like this ! The following picture shows how she tackled her self-induced problem. After she had noticed her "mistake", she finally felt at ease to deal with the question and went on to solve the task in her journal.



Geometrie 10.5.11

An einer Figur kann man vieles verdoppeln. Ich habe mich entschieden, dass ich die Winkel an der Figur verdopple und halbiere.

90° · 2 = 180°

Im Quadrat gibt es vier rechtwinklige Winkel. Wenn ich alle vier verdopple bekomme ich pro Winkel 180°.

Aber das geht nicht. Es ergibt eine Strecke. 180° ist die Hälfte von 360° und somit eine gerade Strecke. Das war mein Fehler.

Translation of journal entry: There are many things you can double. I have decided to double ... the angles: 90°·2 = 180°. There are four right angles in a square. If I double all four, I get 180° for each angle. But this is not possible. It would give me a straight line … my mistake.

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