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The difficulties of the teaching of analysis in the transition of the middle and higher education at Kaposvár University

I have been teaching for 25 years. I used to teach in the lower and higher classes of primary school and secondary school, too. I have been teaching at Kaposvár University for 4 years.

I have been dealing with Bruner's representational theory and I am trying to adapt it to my research. Bruner examined the codes with the help of which man stores the information arriving from the external world. All thought processes may happen on one of three kinds of level according to it:

- Material level (actual objective acts, activities)
- Iconic level (visual education, situation)
- Symbolic level

The 3 representation methods take part in each phase of the teaching process. In my opinion visual education is very important, that is why I tried to provide everyday, lifelike illustrations to help the acquisition of the material.

My students study:

- Agribusiness and agricultural rural development programme
- Agricultural engineering programme
- Finance and accountancy programme

We find that our students have little success in mathematics. But why is it so? In my opinion one of the reasons is that higher education became multitudinous, and so even the ones with average ability get into universities. On the other hand: as I see, the problem is that in the teaching-learning process the foundations of mathematics is left for higher education, but this way the acquisition of other subjects is hindered, too, became the "laying of foundations" is not finished yet.

The teaching-learning process is damaged on the different levels of education.

How can we make up for these differences in higher education?

I think this topic is important because analysis of mathematics is a basic subject for our students and they have to know functional operations in order to be able to describe economic processes with the help of functions.

We found that they have deficiencies in the following:

- The order of doing operations on numbers (this is very important)
- The rules of the index laws
- Methods of fractions

Before starting studying the students are tested in mathematics. Questions are about the number and function abstraction and about the model creation in the test. We reveal their deficiencies based on their solutions.

We saw the weakest result in the solution of solving the equations and inequalities and defining of the domain, too.

In these tasks the students could achieve only 10-20%.

These types of tasks are really important in the course of the first six-month (semester) mathematics.

We recommend an optional subject to the students. It was called Teaching of mathematics using the computer. This course was going in parallel with the mathematics I. (calculus) subject.

85% of the students took the course. We taught with my colleague in 3 groups: finance and rural development students and in a mixed group.

The subject had a threefold aim:

- The development and conditioning of the basis
- To link it closely with higher mathematics
- To link it with the use of computers.

I first tried to develop:

- To solve the equations and inequalities, because we have to use at the monotonic sequences and find the limits and define the domain, too

We dealt with the next types:

$$\frac{3x-5}{2x+3} < 1 \quad (1) \quad \left| \frac{3-4x}{9+2x} + 2 \right| < 1 \quad (2)$$

Methods on expressions helped by work using numbers; we had to substitute many numbers for the expressions.

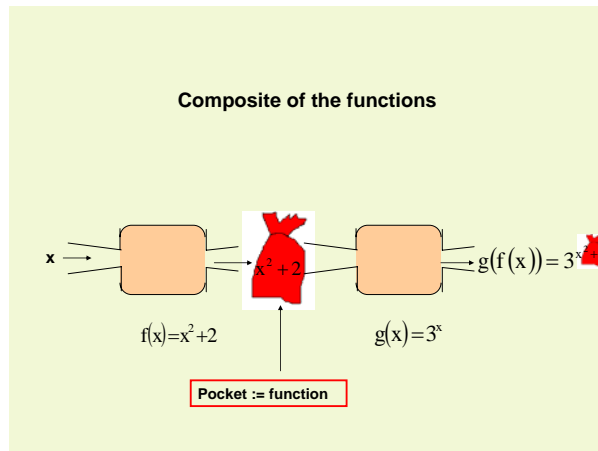
They had many problems of the monotonic sequence to determine number $n+1$ in a series.

I teach it in the following way:

$1 \mapsto \frac{2 \cdot 1 - 3}{5 - 1} \quad 2 \mapsto \frac{2 \cdot 2 - 3}{5 - 2} \quad 3 \mapsto \frac{2 \cdot 3 - 3}{5 - 3}$
 $4 \mapsto \frac{2 \cdot 4 - 3}{5 - 4} \quad \circ \quad \circ \quad \circ \quad n \mapsto \frac{2 \cdot n - 3}{5 - n}$
 $n := (\quad)$
 $(\quad) \mapsto \frac{2 \cdot (\quad) - 3}{5 - (\quad)}$
 $\uparrow \quad \quad \uparrow \quad \quad \uparrow$
 $n+1 \quad \quad n+1 \quad \quad n+1$

- another problem is the composite function, because we have to use it at the derivative functions

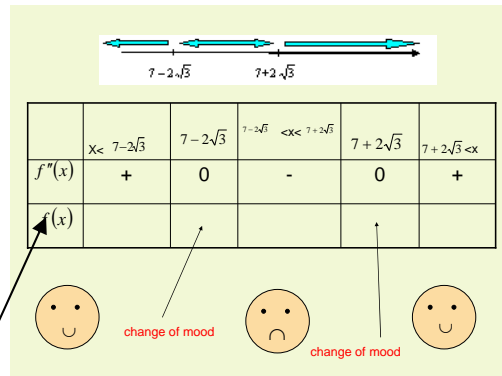
I teach it in this manner:



(packet disassembly)

I made the table about **the derived of the composite function** (packet= function).

The next table shows the convex or concave of the function:



change of mood = inflection point

We also discussed the functional representation, there was an opportunity to consider the domain, where it is worth representing them, we could apply Excel for the multiplication and reciprocal of functions. It also helped in understanding limit value.

The illustration of fundamental conceptions is relatively good. However only few if any were able to illustrate the functional diagram based on the features resulting in the means of differential calculus. Excel provided help in this problem. I discovered that the students enjoyed using the computer for checking, after we had solved the tasks in a traditional way.

At the beginning of December we made the students write the test again.

I think the use of the computer is an opportunity to help the interaction between the cognitive levels listed above. In the last semester we collected positive feedback during teaching this subject. The use of Excel is effective, and it facilitated the formulation of the definitions of sequence

and function. It was important to use a programme which is available for every student and they can use it during preparation, as well. Within the frames of this subject there is a possibility for development in my opinion. After finishing the exams I enquired the students' opinion concerning the subject:

- Did the subject help in the revision of the relevant chapters of the secondary school teaching matter? Yes 79% Partly 21%
- Did it facilitate to concentrate on the mathematical problem? Yes 59% No 12% Partly 29%
- Did you use Excel for checking at home? Yes 36% No 47% Partly 17%
- In your opinion would it be useful to connect the sequel to further mathematical studies? Yes 68% No 3% Partly 29%

The opinions of our students:

- The lessons were held in a pleasant and relaxed atmosphere; they helped me to understand new information, and enriched my knowledge.
- It was very useful and rewarding.
- It was a great help to make up for my deficiencies. I appreciated the relatively slow pace and the step-by-step solutions.
- The secondary school teaching material became more systematic, owing to the subject.
- It helped a lot to understand the subject-matter of the lectures.
- In my opinion it helped me in the practical acquisition of mathematics. The representation of functions in Excel supported the visualization of the tasks solved in an algebraic way.
- It was useful, it helped in learning.
- It would have been more enjoyable in a bigger classroom, with more working computers. Excel did not cause any problems, it is an excellent means for checking. It is a pity that due to schedule problems, I could not register for the subject any longer.

In the future we plan the application of computer methods in the further basic chapters of mathematics.

Bibliography:

[1] Ambrus, A.: Bevezetés a matematika didaktikába, 35, ELTE EÖTVÖS KIADÓ, Budapest, 2004