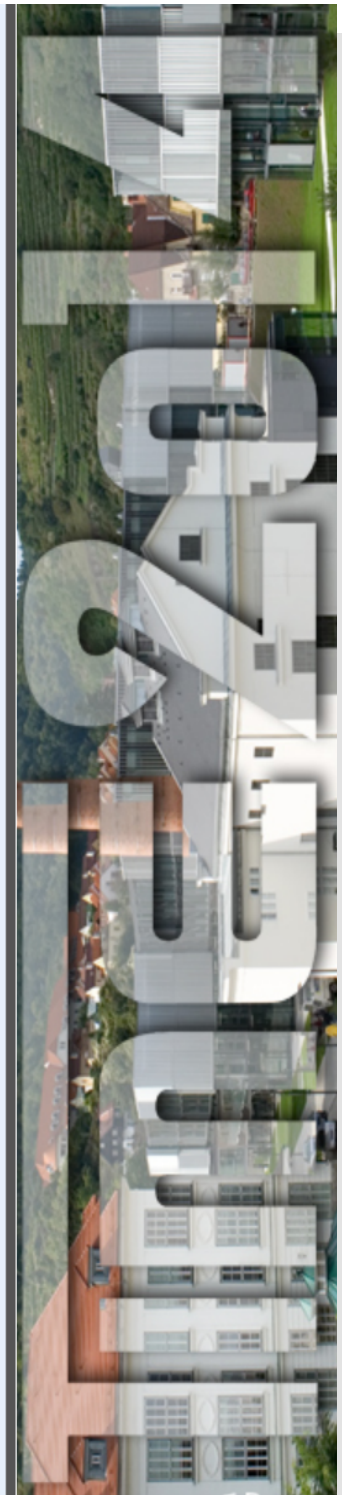

Using TI-Nspire in a Modelling Teacher's Training Course

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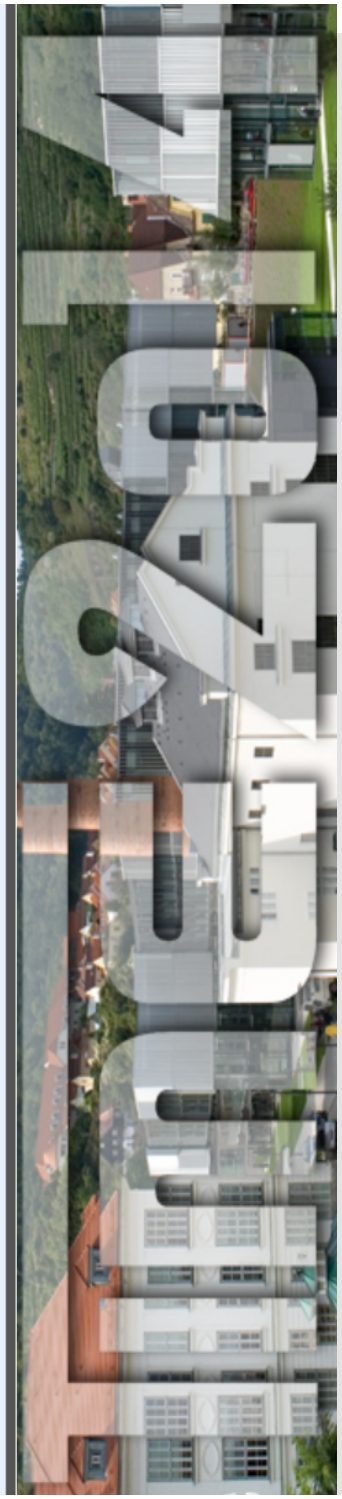
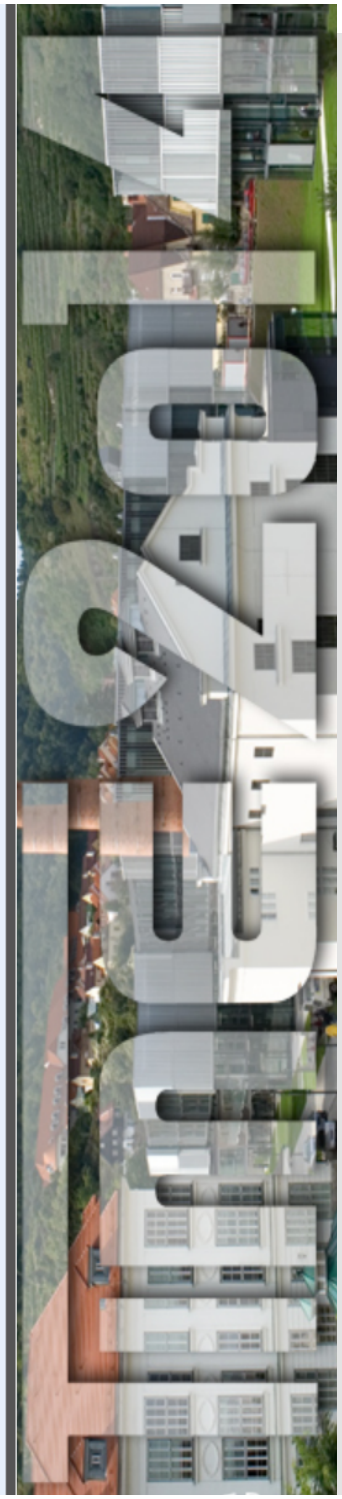


Development of a teacher's training course

Teachers of Mathematics for high school in Mexico City

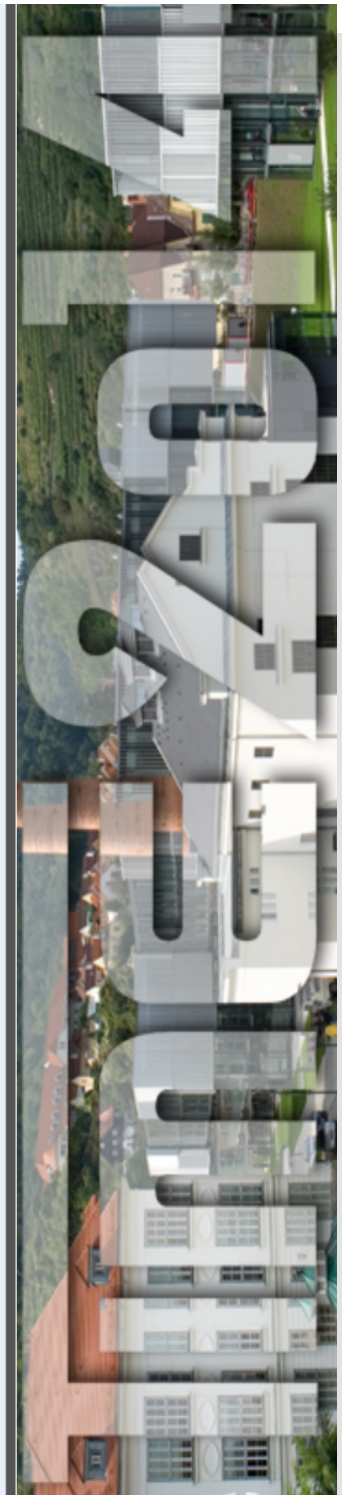
TI-Nspire CX CAS calculators as a tool to pose and solve modelling problems

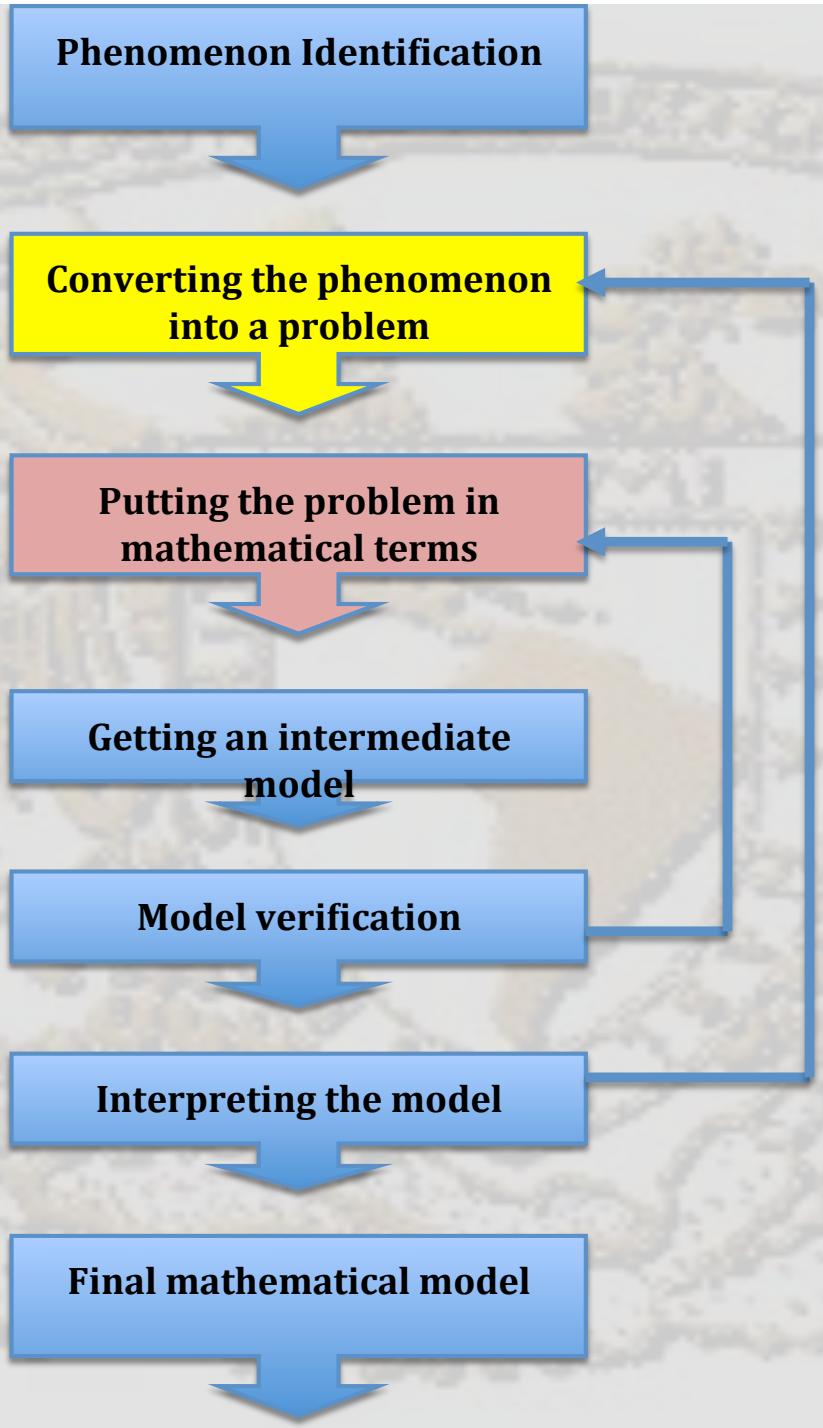
Learning Mathematics, Doing Mathematics.

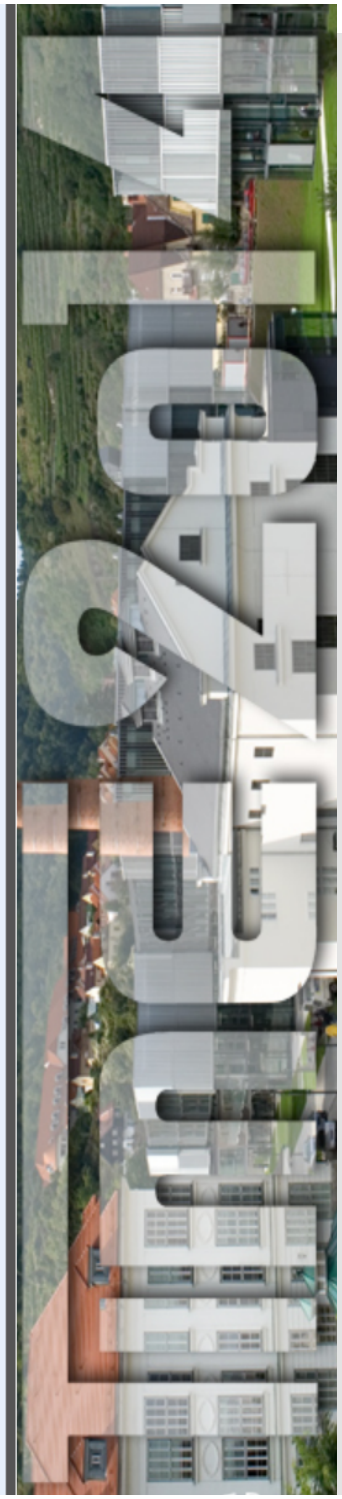


Highlight

- The kind of problems
- The use of calculators
- Teachers' attitudes and beliefs
- Teachers' perceptions

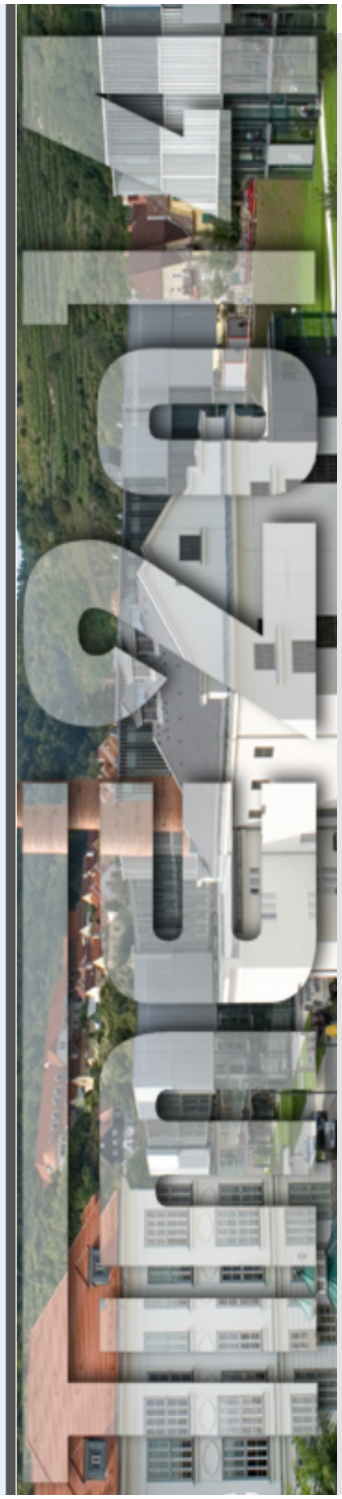



Phenomenon Identification
Converting the phenomenon into a problem
Putting the problem in mathematical terms
Getting an intermediate model
Model verification
Interpreting the model
Final mathematical model



Kind of mathematical modeling activities

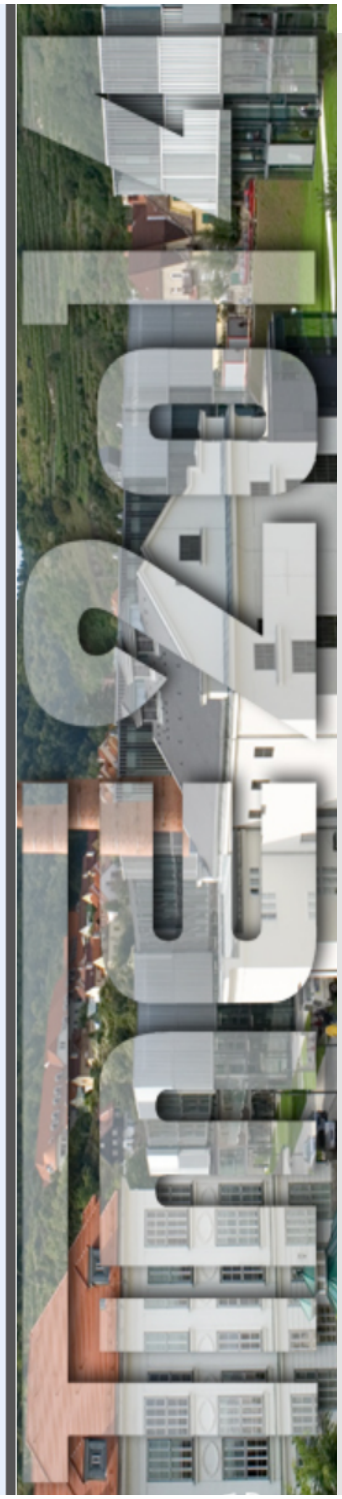
- ***Think and act activities*.**
- ***Curve fitting activities*.**



The problem

A goat is tied up at the corner of a rectangular cottage (3 x 5 meters) in the middle of a huge grass field. What is the area the goat can cover depending on the length of the rope? What's the length of the rope if the goat can cover a 50 squared meters area? Construct a plot of the model.

Find a mathematical model that describes the area covered in terms of the rope's length. Explain in full detail your model.



Think and act activities

Pupils use their mathematical skills

Find the model that will solve the problem

Search for new mathematical knowledge that can help

Solving the problem

Si $r \leq 3$

$A(r) = \frac{3}{4}\pi r^2$

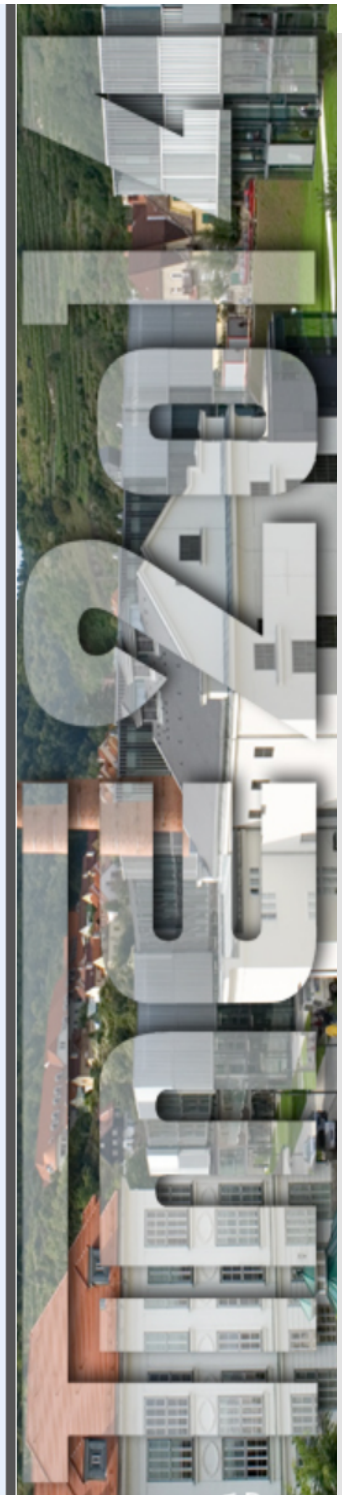
$\frac{3}{4}\pi r^2 < \frac{3}{4}\pi(9)$; $\frac{27}{4}\pi < \frac{27(4)}{4}$

$27 < 50$

$A(l) = \frac{3}{4}\pi l^2$ si $0 \leq l \leq 3$.

Luego si $A(l) = \frac{1}{4}\pi\left(3l^2 + (l-3)^2\right)$ $3 < l \leq 5$

y $A(l) = \frac{1}{4}\pi\left(3l^2 + (l-3)^2 + (l-5)^2\right)$ $5 < l \leq 8$



Solving the problem

$\frac{3}{4}\pi r^2 < \frac{3}{4}\pi(9)$; $\frac{27}{4}\pi < \frac{27(4)}{4}$

$27 < 50$

De tal manera que, con un radio $r \leq 3$ no se cubre una área de $50\,m^2$

¿Cuál es la longitud del lazo, para el cual la cabra, cubra una área de $50\,m^2$?

$\frac{3}{4}\pi r^2 + \frac{1}{4}\pi(r-3)^2 = 50$

$\frac{3}{4}\pi r^2 + \frac{1}{4}\pi(r^2 - 6r + 9) = 50$

$\frac{3}{4}\pi r^2 + \frac{1}{4}\pi r^2 - \frac{6}{4}\pi r + \frac{9}{4}\pi - 50 = 0$

$\pi r^2 - \frac{6}{4}\pi r + \frac{9}{4}\pi - 50 = 0$

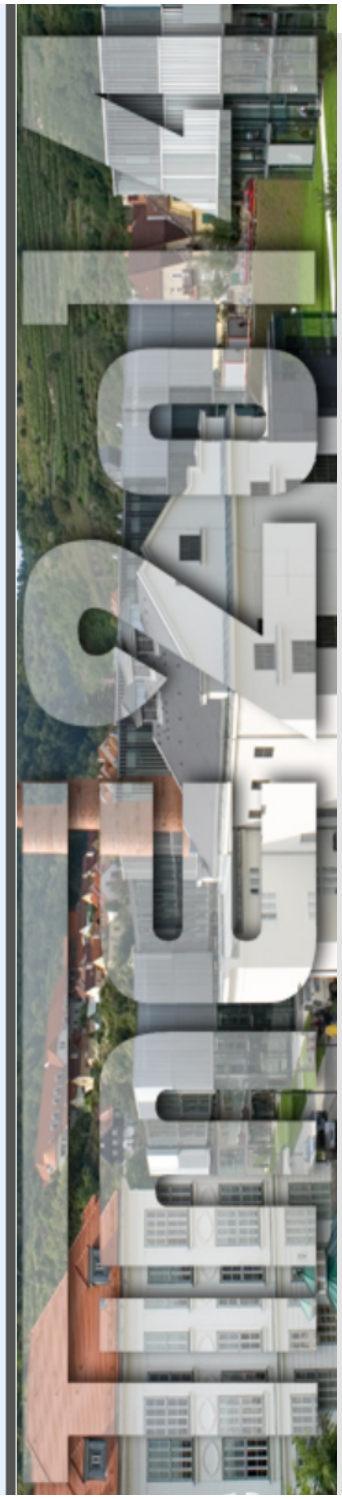
$4\pi r^2 - 6\pi r + 9\pi - 200 = 0$

$r = \frac{6\pi \pm \sqrt{36\pi^2 - 4(4\pi)(9\pi - 200}}{8\pi}$

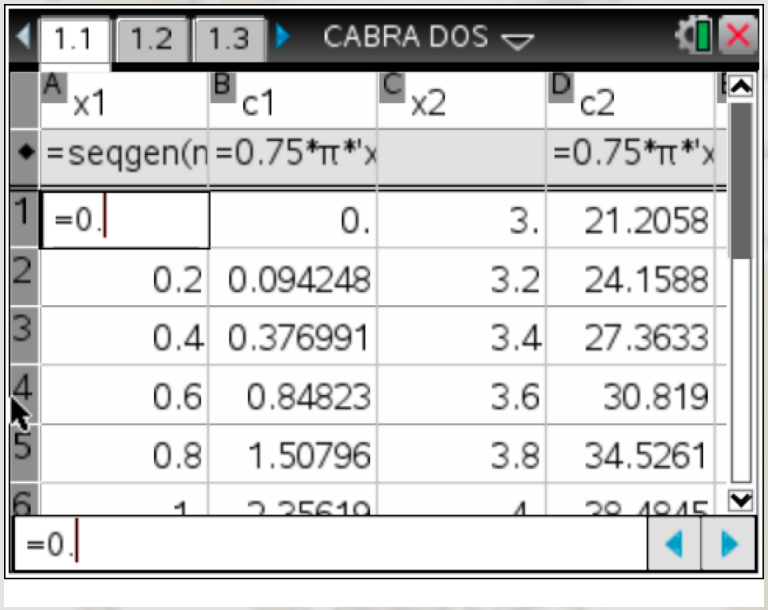
$r = \frac{6\pi \pm \sqrt{-108\pi^2 + 3200}}{8\pi} = \frac{3\pi \pm \sqrt{800\pi - 27\pi^2}}{4\pi}$

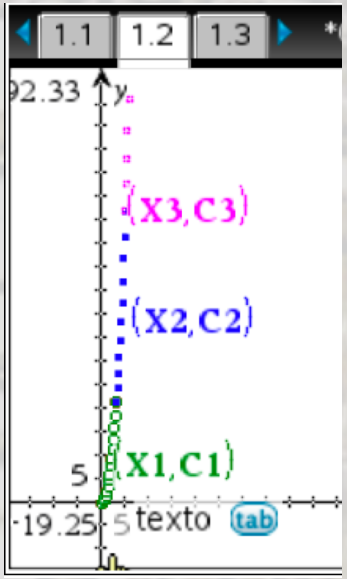
$r = \frac{3\pi + \sqrt{800\pi - 27\pi^2}}{4\pi}$ es la longitud del lazo

$r \doteq 2.58808$



Solving the problem





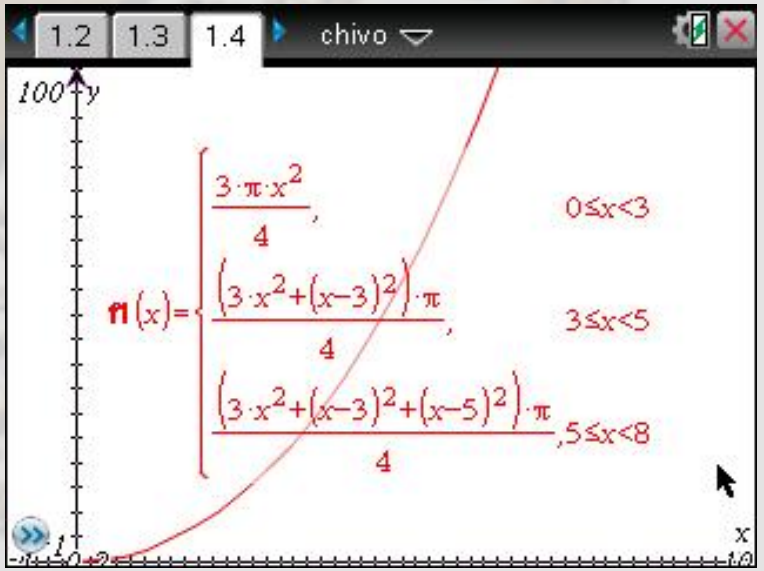
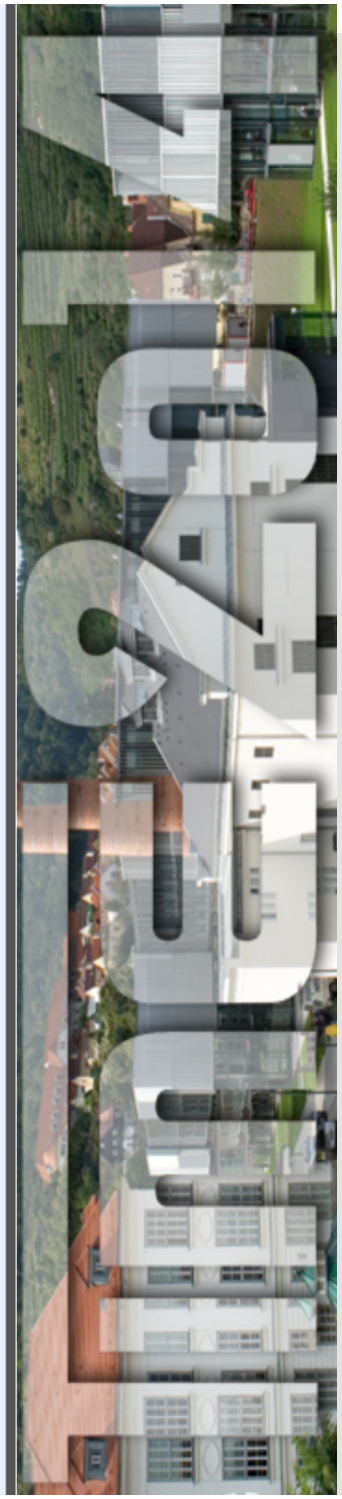


Figure 5



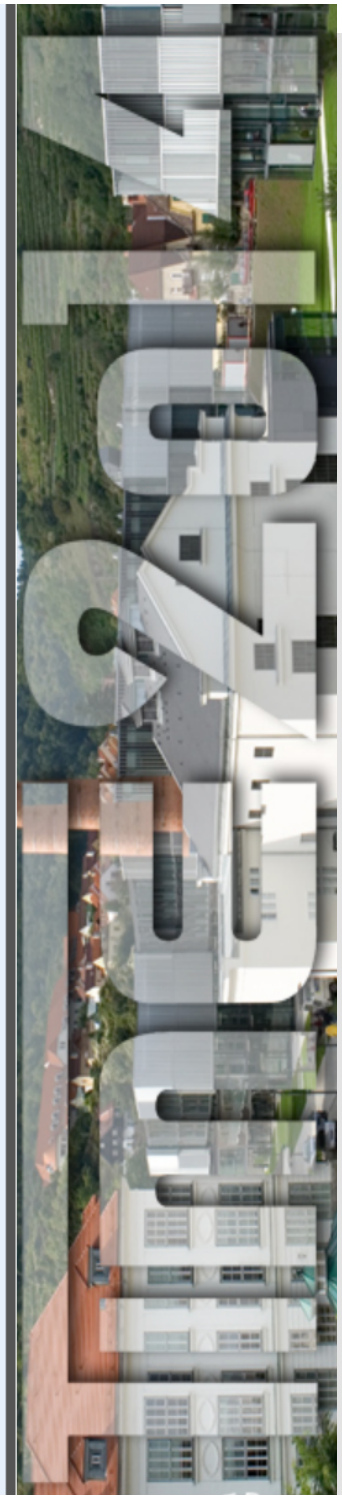
On the use of calculators

Some teachers did not know how to use them, and some others did not want to use them.

They are afraid that their students notice that they do not know about the use of calculators.

Other teachers think that the students will forget the basic mathematical operations.

With the calculator students have not the need of thinking further.



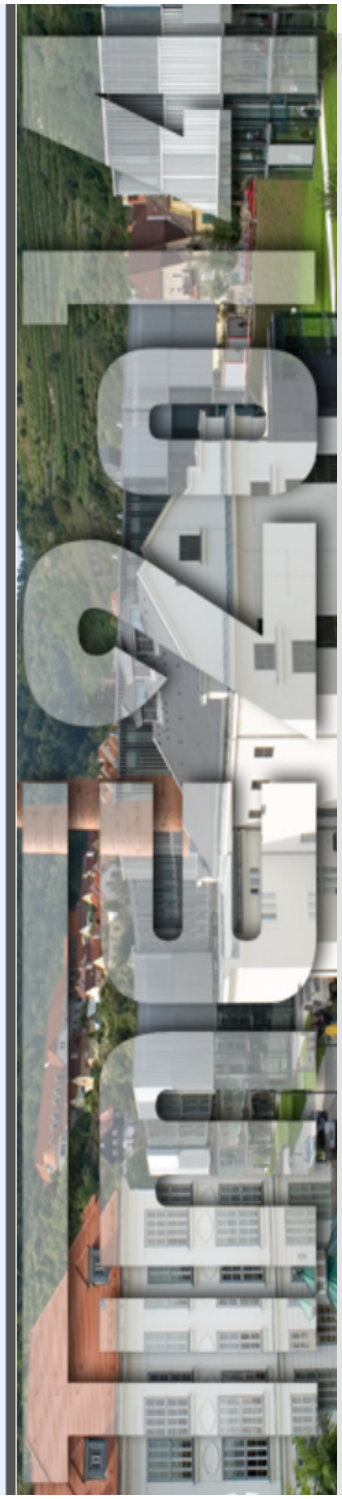
Perception of the course

Bitácora COL
(Ordered Language Comprehension Log)

The modelling problem is more important than the use of technology.

Some teachers felt fine about the freedom given for exploring of calculator's function and others felt uncomfortable.

They asked for step by step instructions and manuals.

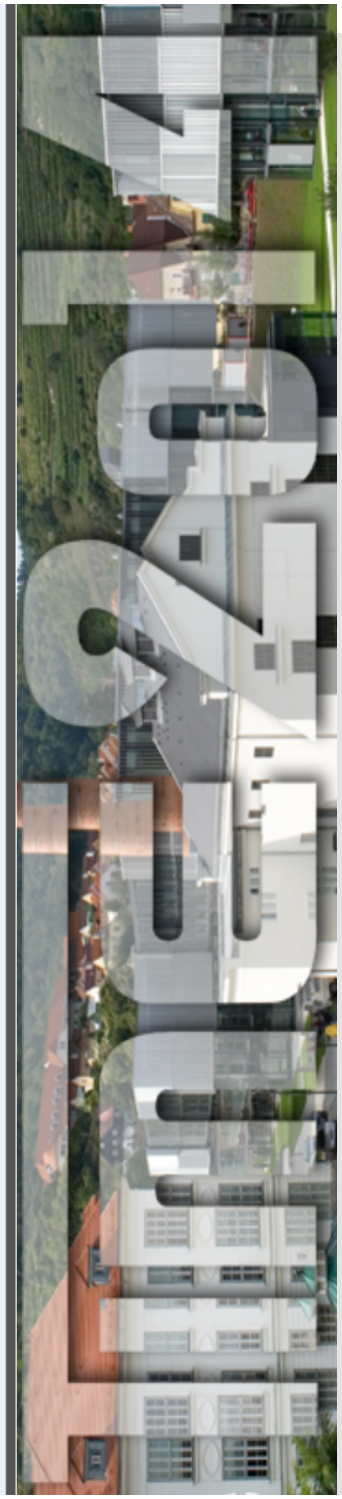


Conclusions

Some teachers commented that the mathematical modelling is a useful tool, but they think is difficult model with the students' skills.

We observed some contradiction about the way they use the technology, thus there is the need of a balance between the two positions.

We noted some opposition to explore and to find things by themselves; this is the same attitude we found in our students.



Thank you
Danke schön

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Seminario de Evaluación Alternativa en Matemática