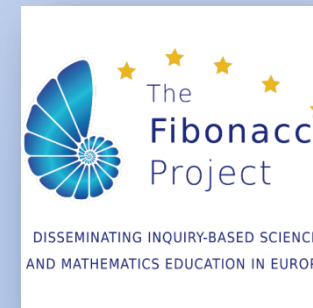# Field Visit Bayreuth

15 – 19 November 2010
Reference Centre University of Bayreuth

Possibilities to Enforce Inquiry and Problem Based Education in Mathematics

Developing a Problem-Based Culture

One problem – different ways

' Would you tell me, please, which way I ought to go from here?'

`That depends a good deal on where you want to get to,' said the Cat.

(Dialogue between Alice and the grinning Cheshire Cat in „Alice in Wonderland" by L. Carrol)

Developing a Problem-Based Culture

Variation of a Theme

Same problem, different ways

How do you solve it?

Which previous knowledge is needed?

A Jungle Story

56 vultures, well known from the jungle book, are sitting around on three trees, well-fed and very bored. "What could we do?", one of them asks. "I don't know", another one yawns.

Just to do anything, 4 vultures fly from the first to the second and 9 fly from the second to the third tree. Now on the second tree there are twice as much on the first tree and on the third tree are twice as much on the second.

Developing a Problem-Based Culture

Variation of a Theme

Which way did you choose?

A system of equations like this?

I. $x + y + z = 56$

II. $2(x - 4) = y - 5$

III. $2(y - 5) = z + 9$

Or something like that?

A Jungle Story

56 vultures, well known from the jungle book, are sitting around on three trees, well-fed and very bored. "What could we do?", one of them asks. "I don't know", another one yawns.
Just to do anything, 4 vultures fly from the first to the second and 9 fly from the second to thethird tree. Now on the second tree there are twice as much on the first tree and on the third tree are twice as much on the second.

x → 2x → 4x

-4   +4 -9   +9
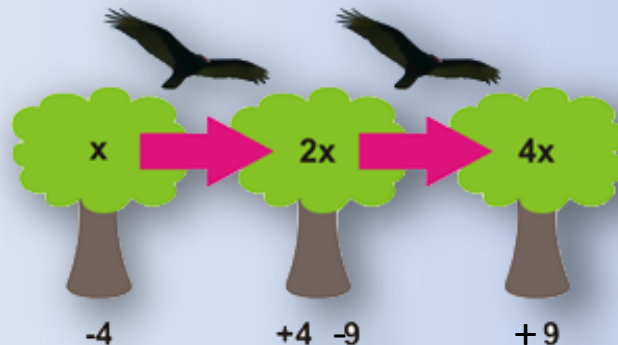
Developing a Problem-Based Culture

Variation of a Theme

Fractions on the number scale

No comment

Developing a Problem-Based Culture

Open Ended Tasks or Rich Learning Tasks

How to open „one way" tasks –
some possibilities:

- give incomplete information

- give more than needed information

- vary some information

- invert a task (start from the result)

- enable (and allow!) pupils to find different solutions

- let pupils argue and discuss, accept also wrong tracks

TECHNICAL SPECIFICATIONS		
DIMENSIONS	Height	85 cm (33.5")
	Width	60 cm (23.6")
	Depth	57 cm (22.4")
POWER SUPPLY VOLTAGE		220-240 V/50 Hz
TOTAL POWER ABSORBED		2750 W (13A)
WATER PRESSURE	Minimum (hot)	5 psi (3.5 N/cm²)
	Minimum (cold)	7 psi (4.8 N/cm²)
	Maximum	110 psi (76 N/cm²)
MAXIMUM RECOMMENDED LOAD	Cotton, linen	4.5 kg (10 lb)
	Synthetics, delicate fabrics	2 kg (4.5 lb)
	Wool	1 kg (2.2 lb)
SPIN SPEED	Maximum	800 rpm (FL850-FL850 AL)
		1000 rpm (FL1085-FL1085 AL)

Zeit mal wieder ein Faß zu öffnen !

A picture is Worth a Thousand Words ….
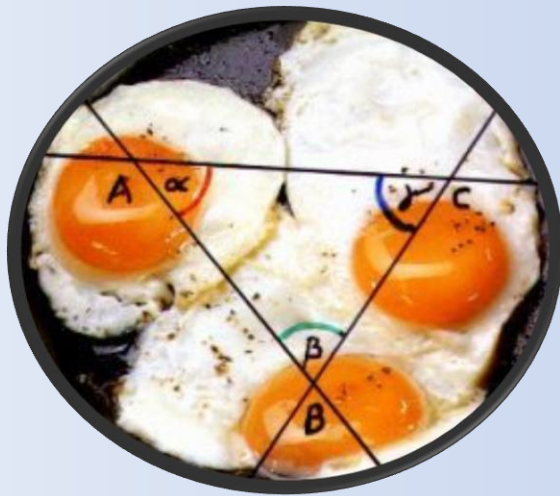
Mathematics for Gourmets

http://mathekiste.wordpress.com

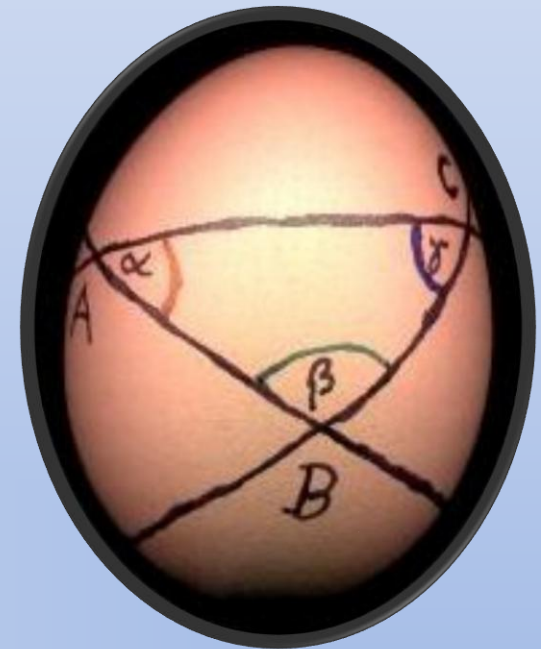# Developing a Problem-Based Culture

Euklidean and Egg Geometry

Angular sum in a triangle

What's planar triangle supposed to mean?

Find out some features
of triangles placed on an
egg!

Source:
http://www.didaktik.mathematik.uni-
wuerzburg.de/projekt/mathei/

Developing a Problem-Based Culture

Dynamic Learning Environments

Round Meets Angular

Two figures are seen:

A triangle and a circle.

Draw this two figures on a piece of paper
and they will remain as they were –

a triangle and a circle.
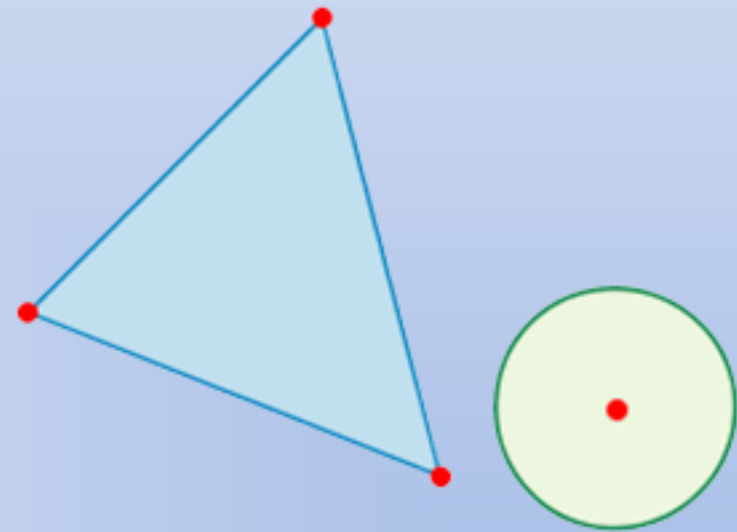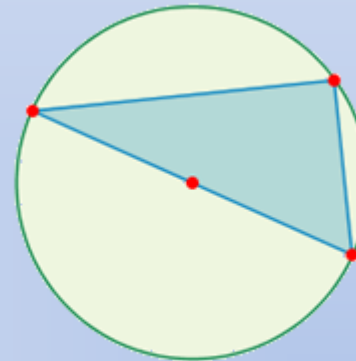
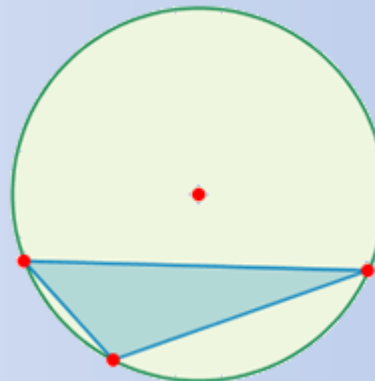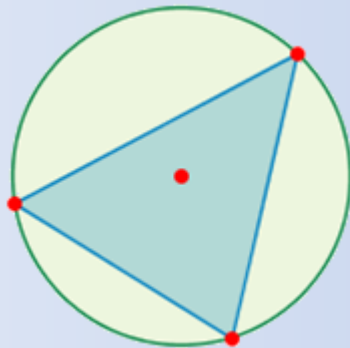# Developing a Problem-Based Culture

Round and Angular

Make things moving …..
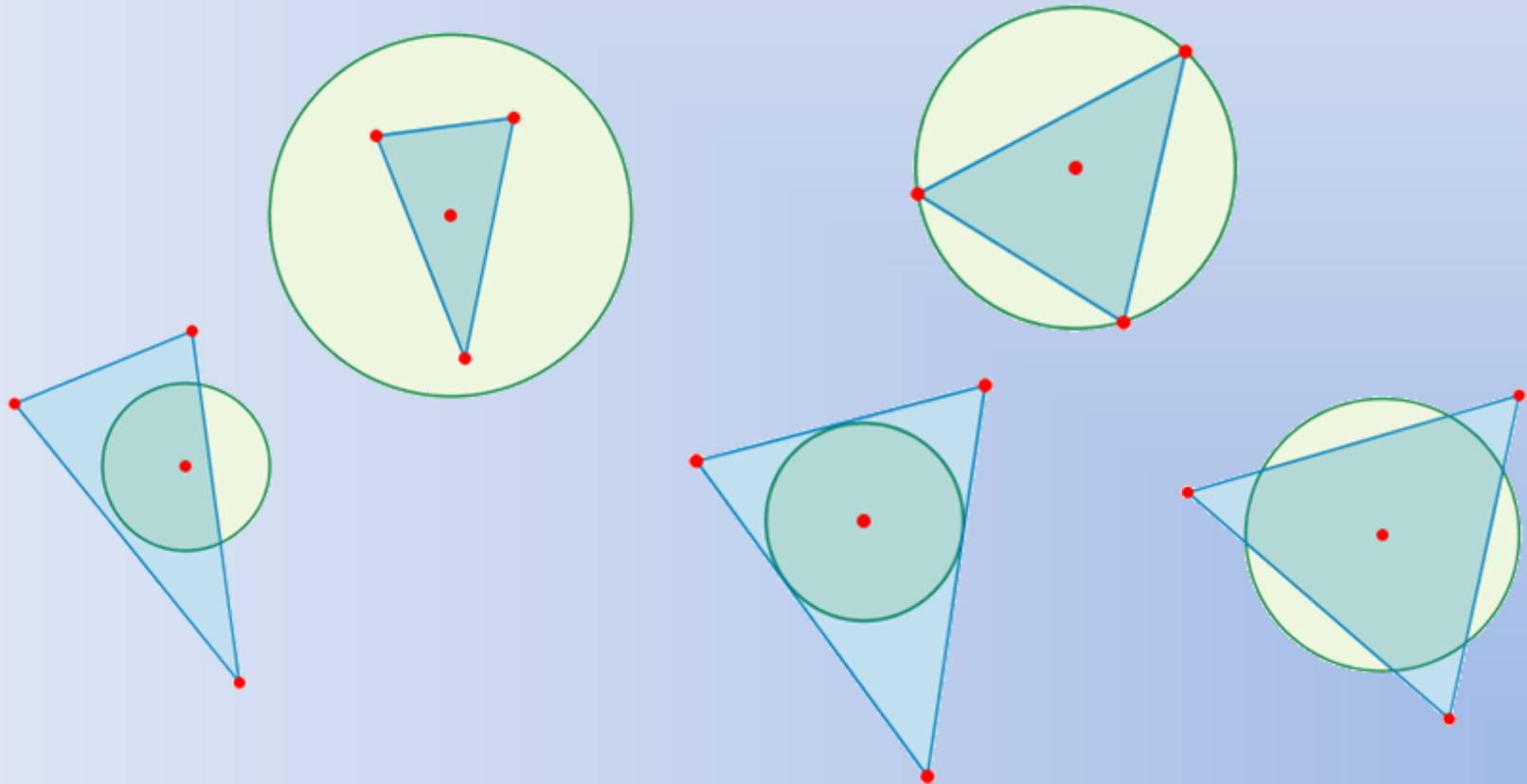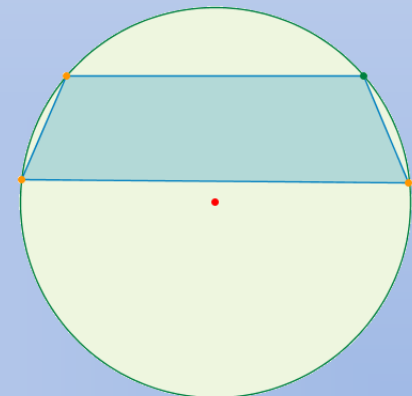
Developing a Problem-Based Culture
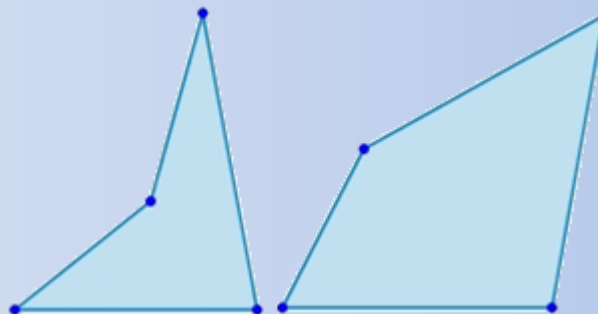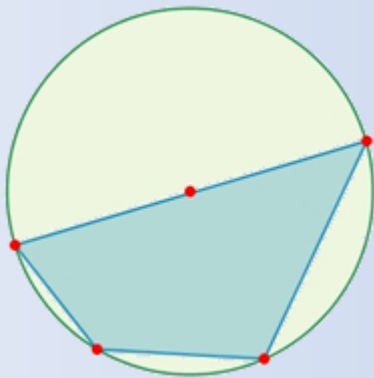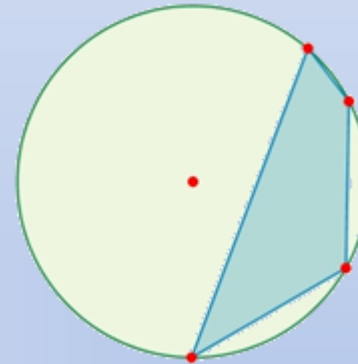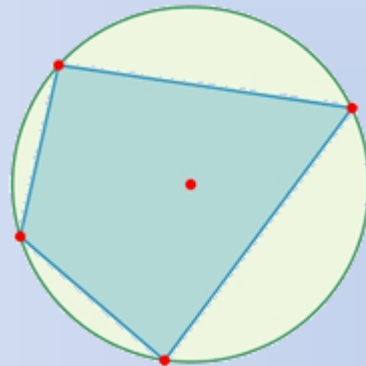
Round and Angular

Special conditions for triangle and circle –
find circumcircle and inscribed circle
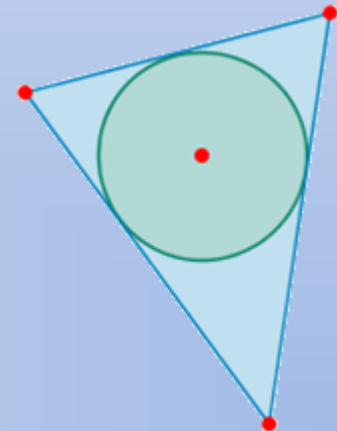
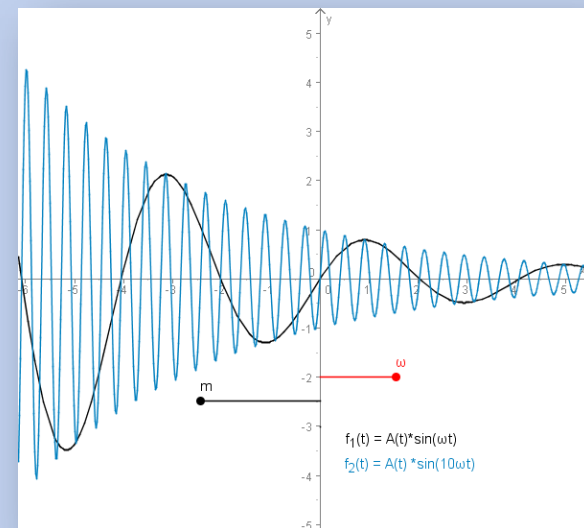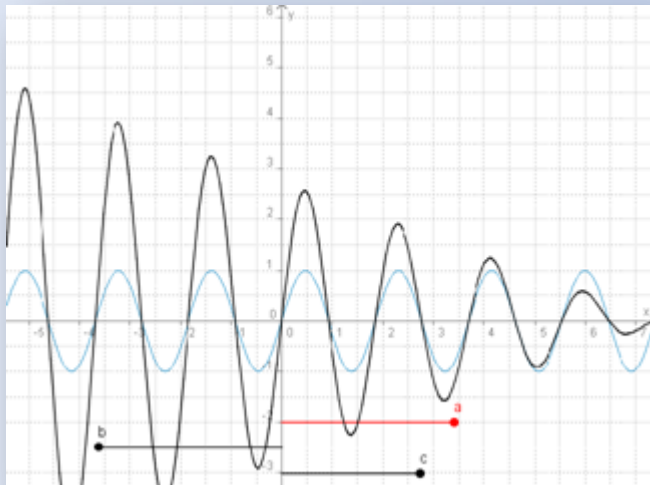# Developing a Problem-Based Culture

Round and Angular

Can you find a circumcircle
for every quadrangle?

Possibilities to enforce inquiry and problem based education

Interdisciplinary Approach

From oscillation to exponential functions

$f_1(t) = A(t)*\sin(\omega t)$
$f_2(t) = A(t)*\sin(10\omega t)$

Interdisciplinary approach

Damped Oscillation – Technical Application

The growth of bridge spans also leads to an increasing length of required stay cables. As longer the steel cables, as more sensitive they are to dynamic excitation.

Cable vibrations may lead to several problems:

- Resonance, resulting in structural damages
- Reduction of comfort for traffic crossing the bridge
- Fatigue problems of the cables, hangers or other components, reducing the service life

Source: Maurer Söhne Group
www.maurer-soehne.de

Interdisciplinary approach

Damped Oscillation – Technical Application

Adaptive cable dampers (ACD), using a magnetorheologic (MR) damping fluid, effectively reduce the cable displacement amplitudes as well as the accelerations.
MR-fluids are a dispersion of carbonyl iron powder in a carrier fluid. The shear stiffness of the fluid changes under a magnetic field.
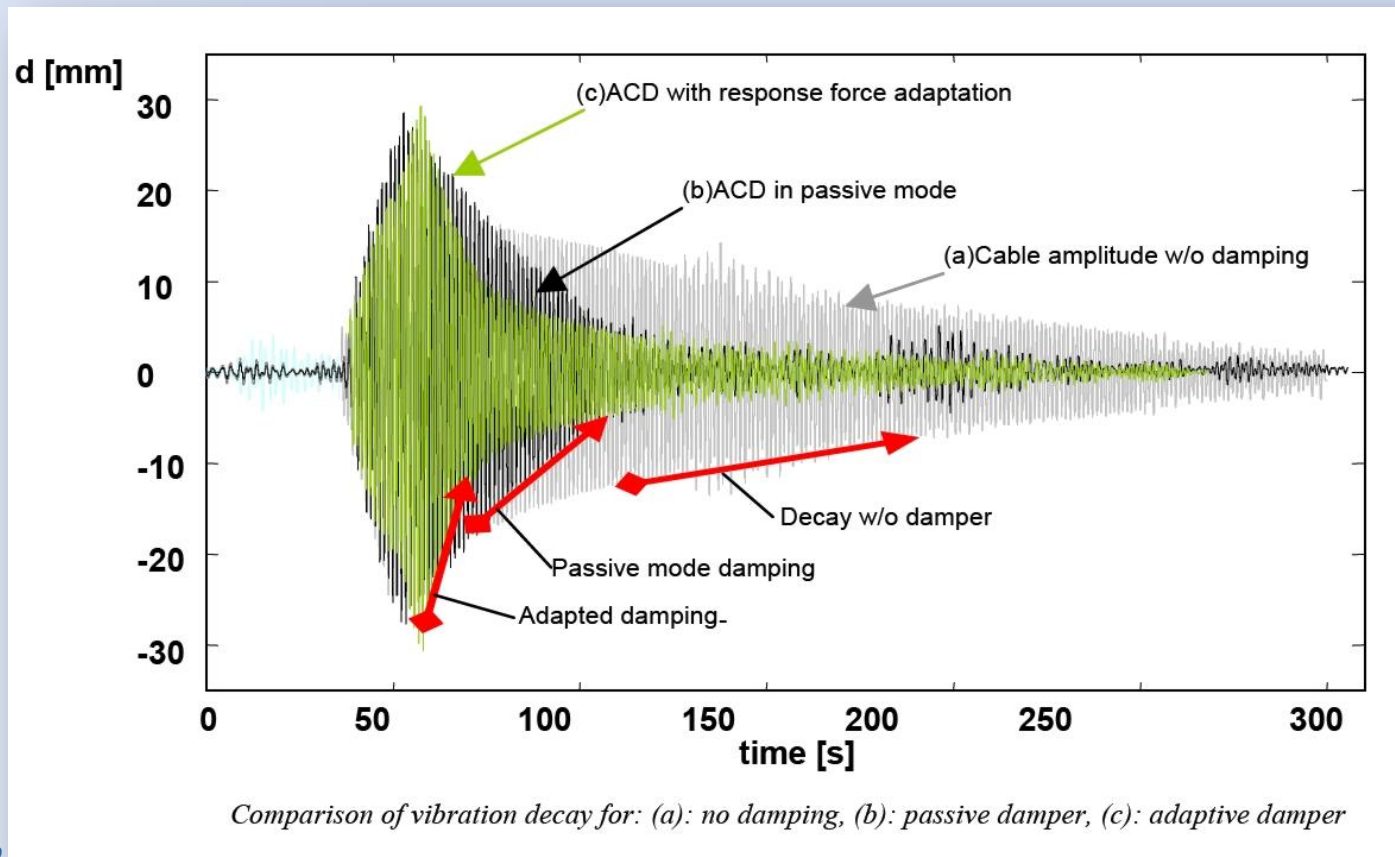

Adaptive Cable Damper (Eiland Bridge, Kampen, NL)
Source: Maurer Söhne Group
www.maurer-soehne.de

Comparison of vibration decay for: (a): no damping, (b): passive damper, (c): adaptive damper

Find out more :

http://www.fibonacci-project.eu
http://www.SINUS-Transfer.de
http://SINUS-Transfer.eu
http://geonext.de

Thank you for your interest!