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**Enhancing Inquiry-based science teaching with online  
resources The examples of VITEN and PEGASE**

**ESERA 2009**

# Outline

- 1. ICT and IBST, the potential of online resources**
- 2. VITEN, an online resource for students and teachers (Norway)**
- 3. PEGASE, an online resource for teachers and teacher trainers (France)**
- 4. Conclusion**

# 1. ICT and IBST, the potential of online resources

Possible interventions of ICT for IBST, a student focus (van Joolingen *et al.* 2007): propose manageable inquiry tasks, scaffold inquiry, reduce the complexity of real research.

Different possible materials:

Simulation, visualisation, modelling, collaboration

Online resources may gather all these possibilities

Possible interventions of ICT for IBST, a teacher focus: propose manageable inquiry tasks, scaffold organization of inquiry in class, propose analysis tools grounded in educational research

# 1. ICT and IBST, the potential of online resources

A central questioning in educational R&D: the quality of online resources  
(Mercat *et al.* 2008)

Dimensions for quality in an IBST-perspective:

- Scientific potential for IBST
- IBST scaffolding
- Possible customization
- Intervention of users in the design
- Collective dimensions
- Ergonomy
- Legal aspects

# 1. ICT and IBST, the potential of online resources

## -Scientific potential for IBST

Clarity of the teaching/learning goals, adequacy of the proposed tasks to the declared goals.

e.g Problem-based, or exploration of a controversy

From an empirical activity towards scientific concepts: experimentation, modelling, evaluation, argumentation, language.

## -IBST scaffolding

For students: scaffolding the evolution process from empirical activity to scientific knowledge. Building knowledge about science.

For teachers: organization of inquiry in class, analysis tools grounded in educational research



## 2. VITEN, an online resource for teachers and students

Interactive exercises, visualization tools

The screenshot displays the VITEN online resource interface. On the left is a navigation menu under the heading "Gene technology" with the following items: Welcome, START, Gene technology and now opportunities (Introduction, Invitation, Make questions), Cells and genes (Structure of the cell, DNA - genetic material, Genes, Exercise), How do you do?, Make your own goals, Proteins, The genetic code (Exercise, Protein synthesis), Mitosis, and Quiz.

The main content area is titled "DNA - genetic material. Exercise 1" and "Build DNA". It contains the text: "Underneath you can see threads in the DNA. Please build the other thread by dragging building blocks to the correct place." A "Start over" button is visible. A "Task status" indicator shows "Not completed" and a progress bar with steps 1, 2, 3, and 4, where step 3 is highlighted.

The exercise area shows a DNA double helix with one strand already built: A T G C G A C T T G A G A C T T. A "Building blocks" box contains four blocks: A (purple), T (yellow), G (red), and C (green).

At the bottom of the interface, there is a footer with the VITEN logo, "Credits", "Some rights reserved", "Give feedback", and "Norwegian Centre for Science Education".





## 2. VITEN, an online resource for teachers and students

Organizing a debate: different roles for the students. Links towards external websites with several kinds of arguments.

The screenshot shows a web interface for a debate. At the top, a green header reads "Debate about gene technology: introduction". Below this is a "channel 9" logo and the slogan "Try to change my opinion". A section titled "Participants in the program:" lists four individuals: Amanda Apple, Paul Product, Florence Flower, and Fred Fertilizer. Amanda Apple and Paul Product are associated with the "For gene modified food" side, while Florence Flower and Fred Fertilizer are associated with the "Against gene modified food" side. Each name is accompanied by a small photograph. At the bottom, the VITEN logo is visible, along with the text "Credits", "Some rights reserved", "Give feedback", and "Norwegian Centre for Science and Society".

Debate about gene technology: introduction

channel 9

"Try to change my opinion"

Participants in the program:

Amanda Apple Paul Product Florence Flower Fred Fertilizer

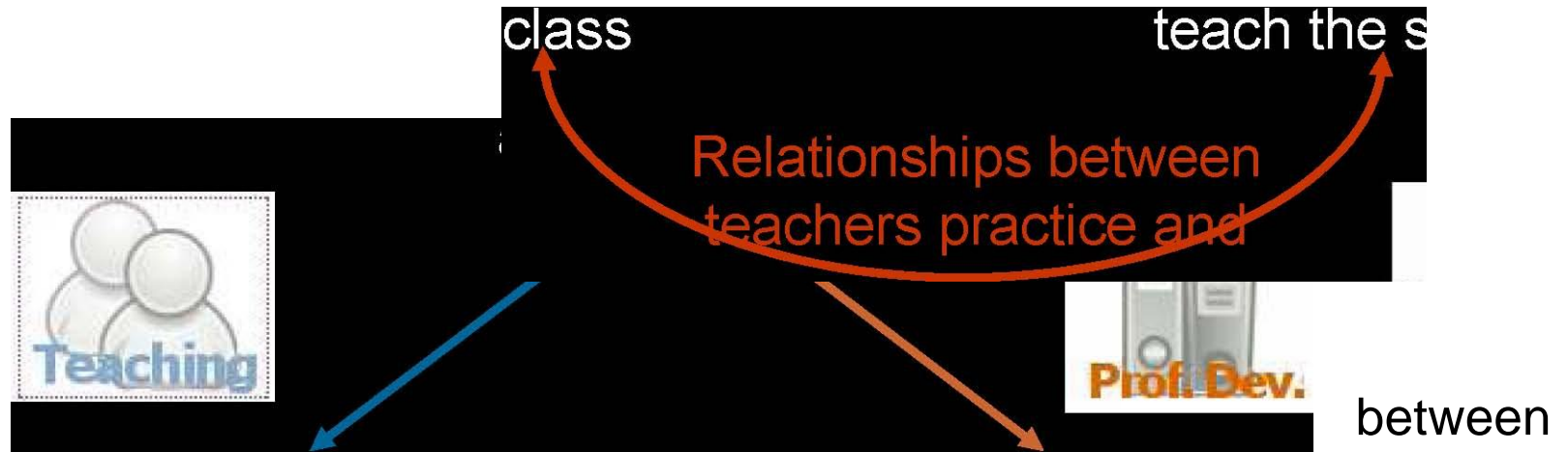
For gene modified food Against gene modified food

VITEN Credits Some rights reserved Give feedback Norwegian Centre for Science and Society

### 3. PEGASE, an online resource for teachers and

teacher  
trainers

Collaboration  
between teachers  
and researchers  
Collaboration  
teachers



Teaching sequences with Resources making the choices comments and video clips of explicit and giving helps to

professional development

# 3. PEGASE, teaching part

## Example in mechanics

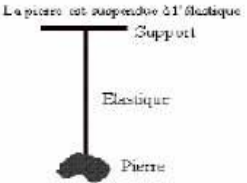
France      **THEME: Mechanics**      English version  
Grade 10 (Grade 10)

**Activité 1: Introducing the notion of action**

You have at your disposal : a support, an elastic string, a stone.

Questions  
a) What are the objects which act on the stone?  
b) On what objects does the stone act?

Read the 1<sup>st</sup> part of the interactions Model and discuss with your group partners in order to check you understand it



Le pierre est suspendue à l'élastique  
Support  
Elastique  
Pierre

Aim    Running the task    Knowledge    Students' behaviour    Providing answers    Version intégrale imprimable

**Ressources liées**

- Marker M1: Activities in which students are not explicitly invited to refer to a model
- Marker M3: Activities in which students discover a new element of a model at the end of the activity
- Marker E1: Elementary material situations allowing to introduce the physics point of view
- Global presentation
- Justification and detailing choices made

Prof. Dev.



### 3. PEGASE, profession onal develop ment part

#### ... Working in small groups:

- Encourages student autonomy when learning new topics. Teachers can assist individual groups where necessary
- Provides the students with a first understanding of new topics through discussion, experimentation and reading

#### Sharing the results with the whole class:

- Encourages students to present and defend their findings to the rest of the class
- Enables teachers to correct any of the findings and sum up the new knowledge covered

The activities thus structure the teaching method

**Teaching: related  
activities**

22.09.2009



video

## 4. Conclusion

VITEN and PEGASE are not specifically designed for IBST; they comprise inquiry tasks, inserted in the curriculum and coordinated with other kinds of courses. This articulation can support IBST implementation by teachers.

-Scientific quality: clear teaching goals; problem-based; from empirical observation to scientific concepts.

-IBST scaffolding: for the students, attributing roles and providing arguments in a debate (VITEN) ; for the teacher, advice for organizing the discussion in class, and description of frequent students' difficulties and alternative conceptions (PEGASE).

Possible improvements: involvement of the users (teachers) in the design process. Forums; report of classroom experiments.