GRAPES in Research Work

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Self-introduction

Introduction

- Nationality: Japanese
- Position: research fellow at CRICED
- Specialty: didactics of mathematics
- PhD: University of Grenoble in France

Fortunately or unfortunately, I will leave soon …

Principle and my work

Introduction

**Mathematics Education
as a scientific discipline**

1. Analysis and modelisation of teaching and learning situations
2. Use of ICT
3. Nature of Proof and its learning in mathematics

Mathematics Education
Is it really a science?

Introduction to Didactic of Mathematics

What do you mean by that, "science"?

Didactic of mathematics

- In the sense that
  - ✓ the target is to unveil the mechanism of teaching and learning phenomena;
  - ✓ like the physics for the mechanism of natural phenomena;
  - ✓ not the description by personal experiences; etc.

What do you mean by that, "science"?

Didactic of mathematics

**Apple is falling since 4000 years ago,
even before Newton of 17th century**

Didactic of mathematics

- **Objective**
  - ✓ To develop the theories that are able to explain the teaching and learning phenomena
- **Theories in Education**
  - ✓ Learning and teaching theory
    - Decide what is the better learning and teaching. It has normative character.
  - ✓ **Scientific theory**
    - Model the learning and teaching phenomena in order to understand the mechanism of learning and teaching.

Is this kind of work really necessary?

YES

- **For international cooperation**
  - ✓ The normal is not necessary the same in different countries
  - ✓ In teaching, we often use ambiguous terms: children centered, "good" lesson,
- **Perspective with other sciences**
  - ✓ Classical mechanics has allowed launching rockets!
  - ✓ In the perspective of Artificial Intelligence
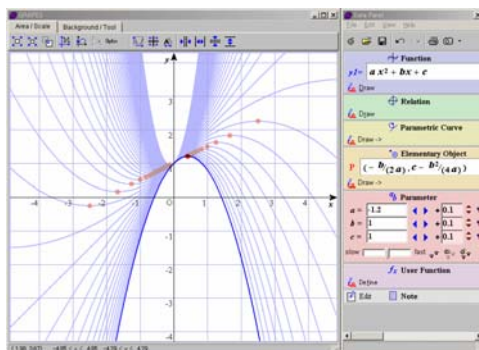 - ✓ Perhaps, it gives some punctual suggestion in teaching by explaining the mechanism of phenomena

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with GRAPES

GRAPES

Description of GRAPES I

- **Freeware**
- **Domain**
  - ✓ Function, Analytical geometry, etc.
- **Language**
  - ✓ Japanese, English, Spanish
- **Grade**
  - ✓ Secondary school (12 – 18 years old)
  - ✓ Beginning of undergraduate

Description of GRAPES II

■ **Functionalities**
- ✓ Like a graphing calculator
- ✓ Visualisation, dynamic movement, etc.
- ✓ Extremely friendly interface

■ **Mode of use**
- ✓ Demonstration by teacher
- ✓ Individual task

Experiments in B&H

Gimnazija Prijedor

Gimnazija Mostar

Questions to be tackled

■ **Exploration et dynamicity**
- ✓ *What* kind of exploration and/or dynamicity allows students to acquire *what* kind of mathematical knowledge? *What* is the conditions of this acquisition?

■ **Interaction between Human and Machine**
- ✓ *What* kind of interaction allows students to acquire math knowledge?

Hvala !