

INTRODUCING COMPUTER TECHNOLOGY TO MATHEMATICS TEACHER TRAINING

Kovács Zoltán

College of Nyíregyháza, Hungary

Technology should be an integral part of the teacher preparation programmes. Computer aided mathematics teaching was included in the Hungarian curriculum of the mathematics teacher training recently. As the main perspective, students must develop competence to decide when and how it is appropriate to use available ICT tools. To meet this demand we developed a course “Computer aided mathematics teaching.” The idea of giving a separate course on using technology in mathematics teacher training, we believe, is fundamental. In a course on technology for teachers, the goal should not simply be to teach the use of several ICT tools, but to provide students with opportunities to think like experts in making instructional decisions, structuring learning activities. In the paper I present the course design and evaluate experiences.

OVERALL DESCRIPTION OF THE PROJECT

This paper presents results achieved in the course “Computer aided mathematics teaching” for part-time students of College of Nyíregyháza, Hungary during academic years 2008/09 (group 1-2, 54 students, group 3-4, 36 students) and 2009/10 (group 5-6, 39 students). The state of the students in these courses was special: the Bologna-type teacher training system in Hungary offers a possibility for teachers with former ‘college level’ degree to get the master's degree and that was the case in these courses. Most of students in the courses had teaching experiences. Our presumptions were the following:

- ICT tools are widely accessible in Hungarian schools
- students have fair skills using ICT tools in everyday circumstances
- they are novice to computer aided mathematics teaching
- teachers' attitude toward using ICT tools in the classroom is rather low.

The course aim is to initiate and support the teachers' professional development to meet the new demands. Ideally, we would like to achieve the following:

- higher attitude toward using technology in the classroom and integrating new materials, as a consequence, increased classroom activity
- extended collaboration between teachers
- competence to proper use of technology
- development of attitude toward research activity.

The data were gathered from interviews, questionnaires and evaluations of students' portfolio.

COURSE DESIGN

The course design was centred around two focus points: tool essentials and medium essentials. Obviously, the teacher must be able to use the tool for problem solving and modelling by him/herself. Work and study in this area is included in the term *tool essentials*. The general aspects of mediating mathematics contents are covered by the term *medium essentials*.

I restricted the possible ICT tools to three issues: dynamic geometry (GeoGebra), computer algebra systems (Maxima) and spreadsheet application (OpenOffice.org Calc).

The easy use of GeoGebra and the plenty of materials widely accessible allow us to concentrate on the evaluation of these materials and the study of the mediation of the mathematics contents. The particular aim is to develop professional communication between teachers.

Even basic use of a computer algebra system is a challenge for most of teachers. Concerning CAS the particular objective is to develop positive attitude toward technology and to integrate new contents into the curriculum (e.g. modelling).

Integrating the spreadsheet applications into the course serves a more direct aim: to present a case study how to implement technology for teaching elements of statistics, following the present school curriculum.

All the contact lessons during the semester were in computer lab and the activity was directly guided by the instructor. We gave a lot of homework:

- 6 applications in the field of dynamic geometry, computer algebra systems and spreadsheet applications
- writing a research article on the technology supported teaching. The instructor gave a personal guidance to the research article.

After Maxima lessons there was a test on using computer algebra system Maxima.

A CASE STUDY: A MAXIMA SESSION

The use of differential equations in the modelling is a topic usually studied by advanced students in mathematics. However differential equations appear in the school curriculum in many hidden ways. Numeric solution leads to difference equations which can be treated easily with computer algebra systems without black boxes. My hypothesis is that numerical methods supported by technology serve as tool that helps the early introduction of modelling concept. Figure 1 demonstrates the project “Population Growth” elaborated during the autumn semester of the academic year 2009/10.

REFERENCES

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□ Limited population growth

The "natural" growth of biological populations, starting with assumptions of growth rate proportional to the population and no restrictions on growth. These assumptions lead to a model formula that is exponential. In this module we model a population for which there is a limit on the population size.

Our Theoretical Assumption: Let B be the maximum population that the environment will support. We assume that the rate of change of the population is proportional to the product of the population and B minus the population: $dy/dt = K*y*(B-y)$.

Transforming it into difference equation we get $y_{k+1} = y_k + dt * K * y_k * (B - y_k)$.

```
(%i1) K:0.040$ B:2500$
      rhs(y):=float(K*y*(B-y))$
      dt:0.0005$ N:200$
```

```
(%i6) y0:150$
      list:[[0,y0]]$
      y:y0$
      for i:1 thru N-1 do(y+y*dt*rhs(y),
      list:append(list, [(i+1)*dt,y]))$
```

```
(%i10) wxplot2d(['discrete,list], [style,[points,1, 1,3]],
[xlabel,"t"],[ylabel,"y"],[legend,false]);
(%t10)
```

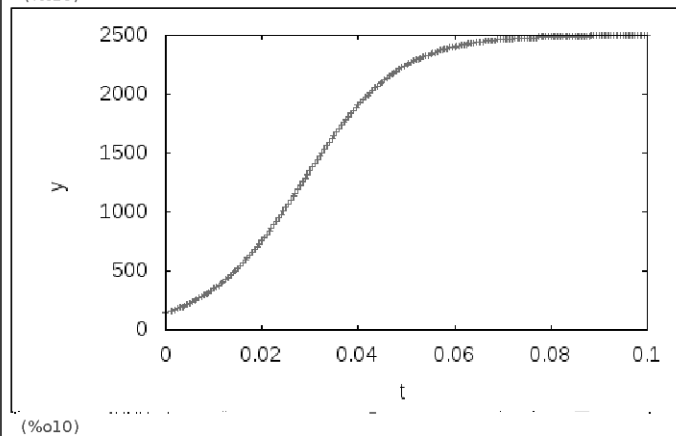


Figure 1: Extract from the wxMaxima worksheet *Limited Population Growth*. (Student's text is translated.)