Mathematics from secondary school to university in The Netherlands

Kolloquium Institut für Mathematik

Johannes Gutenberg Universität Mainz, 15.04.2010

Jan van de Craats

Universiteit van Amsterdam

The Dutch educational system

Age 4 - 12: basisschool (Kindergarten + primary school)

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- Cultuur en maatschappij (Culture and society, C & M)

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Wiskunde D is an optional subject. Not required for any university study

Wiskunde D only in combination with Wiskunde B

Wiskunde D only in the profile N & T

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Wiskunde D only in combination with Wiskunde B

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Profiles and mathematical flavours

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Since 2007, in havo and vwo the following flavours are required:

N & T	Wiskunde B (in addition also Wiskunde D (optional))
N & G	Wiskunde A (or B)
E & M	Wiskunde A (or B)
C & M	Wiskunde C (or A or B) (only vwo)

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Recently, many measures have been taken to remediate this situation. Will it be effective? We shall see.

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Citation (Kees van den Hoeven, Free University, Amsterdam):

‘Voor eerstejaars studenten is het vaak ook een raadsel hoe het kon gebeuren dat zij op het vwo (binnen Wiskunde A) niet of niet goed zijn voorbereid op hun universitaire studie economie of bedrijfswetenschappen, terwijl ze formeel gesproken aan alle toelatingseisen voldoen.’

Transitional problems mathematics

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‘De grafische rekenmachine wordt kwistig te pas en te onpas gehanteerd, maar welke belangrijke functies achter de knopjes *sin* en *log* schuilgaan weet men niet! (“Hoefden we niet te kennen.”)’

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’En ondanks deze bijstelling moeten we toch telkens weer aan het eind van het eerste jaar zo’n 25 procent van de eerstejaars een *bindend negatief studieadvies* verstrekken waarbij de gebrekkige wiskunde-voorkennis een belangrijke rol speelt.’

Is wiskunde A really a success story?

Many didactics people and math teachers in The Netherlands consider Wiskunde A as a big success. It is founded on the ideas of realistic mathematics education (RME), originating at the Freudenthal Institute of Utrecht University. All mathematics is embedded in so-called realistic contexts, and all computations are done with the aid of a graphing calculator (GC)

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- There is no follow-up for wiskunde A in any university study.

Is Wiskunde A really a succes story?

Citation: (Geert Jan Franx, Free University, Amsterdam):

‘Mijn studenten (zowel econometrie, als economie als bedrijfskunde) klagen regelmatig dat ze op het vwo veel te weinig serieuze wiskunde geleerd hebben, en dat ze geestelijk lui gemaakt zijn door de grafische rekenmachine.’

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All first year students economy and management science get a crash course algebra and pre-calculus as a preparation to ‘real’ mathematical courses in the first and second year. Many don’t pass these exams and in many cases have to leave university because of a lack of mathematical skills.

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Schotting ended his lament with three firm strokes with a fist hammer on such a *weapon of math destruction*. This resulted in an ovational applause from the audience.

Weapons of math destruction

photo: Piet Wesseling (em. hl. TUD), afterwards

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The device looked rather unaffected after this action, but, as Schotting said: ‘It didn’t function anymore, and that’s what matters!’

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- All that can be done by a GC, can be done much better and with much more insight using *excel* or computer algebra.
- It impedes mastering 'pre-calculus' (in Wiskunde A and B).
- It is not necessary as a tool in written math exams for testing 'pre-calculus' (in Wiskunde A and B) or analytic geometry (in Wiskunde B)

The use of mathematics in university studies

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In all these studies, in addition to the entrance level in mathematics (wiskunde A or B), many courses in special mathematical subjects are given, aimed at the use of mathematics as a tool in these studies.

Some mathematics courses in science and engineering

Examples of mathematics courses in university studies in science:

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- operational research, optimisation

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- integral transforms, Laplace and Fourier
- vector analysis
- operational research, optimisation
- combinatorics

Some mathematics courses in science and engineering

Examples of mathematics courses in university studies in science:

- linear algebra
- complexe numbers and complexe functions
- functions of more variables
- multiple integrals, integration along curves, surfaces and volumes
- differential equations (ode and pde)
- numerical methods
- integral transforms, Laplace and Fourier
- vector analysis
- operational research, optimisation
- combinatorics
- logic

Mathematics in other university studies:

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- ‘Problem solving abilities’ and ‘creativity’ don’t play any role.

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- For this, mathematical axiomatics and proof techniques are not necessary.

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- Learning has to be fun.

Zum Abschluss:

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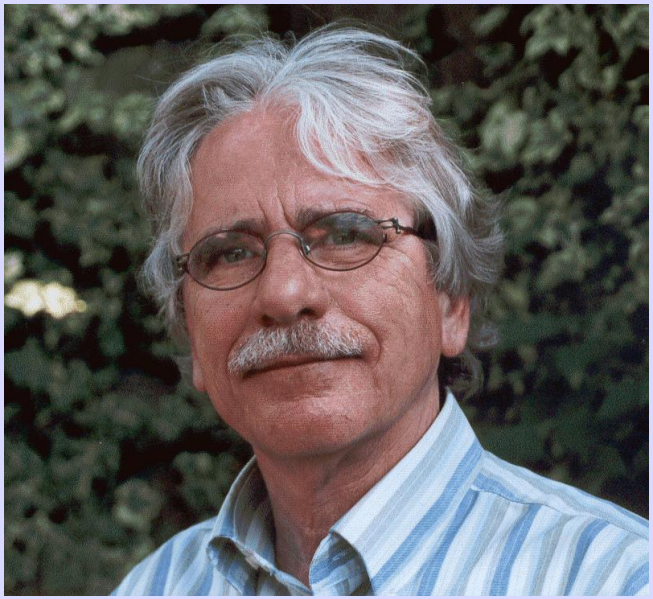

http://staff.science.uva.nl/∼craats

Vielen Dank!

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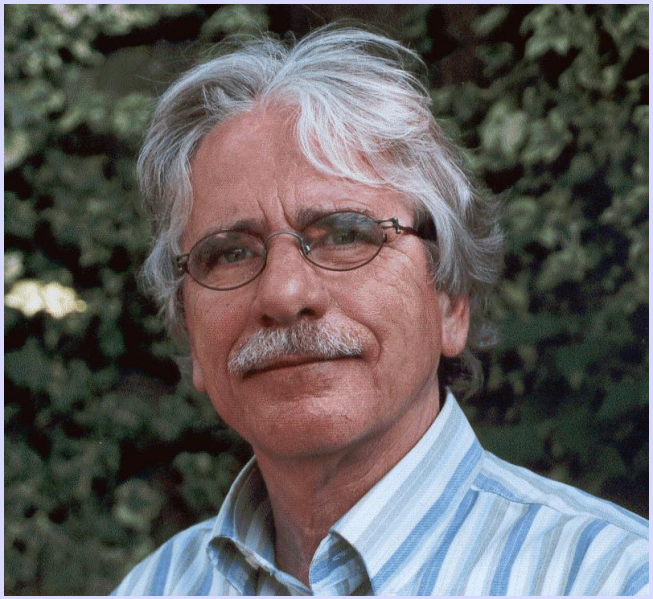

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