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Zinc Violet, case studies in the use of advanced teaching tools in widely different settings

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Abstract
The development of advanced teaching tools using simulation is costly and often of limited value to the institution developing it. The investment can only be regained if the teaching tool can be used in other places and/or a wide range of applications. Thus the objective is to assess the usefulness of an advanced teaching tool in a range of settings and cultures. Zinc Violet is a simulation of a problem using real data and data analysis software, characters, reports, literature, role-play and financial or time limitations. The students are placed in a problem that they have to solve where their choices have consequences and the simulations aims to engage them. The programme has a long history of development in two countries and is based on real investigations. All uses of the teaching tool have been formally evaluated in the context of use. Zinc Violet has been used to teach applied epidemiology in three different Masters degrees at three different universities in two different countries. It has also been used in a professional development course in another country. Applications used are applied epidemiology, environmental epidemiology, risk assessment and risk communication. Participants have come from Australia, China, France, India, Ireland, Italy, the Netherlands, Nigeria, Pakistan, Taiwan, UK and other countries. Professional backgrounds have included physicians, nurses, environmental scientists, toxicologists and dieticians. The evaluations have been that the simulations facilitated very good engagement. All research applications were highly successful succeeding in engaging people from all disciplines and cultures. The risk communication application showed only the first half of the simulation to be useful but for that part they were engaged. Continuous technical updating is essential as bugs were found to be irritating. Substantial investments in highly developed teaching tools can pay off in a wide variety of settings. The tool does need to be very rich and engaging and the lecturer needs to ensure different applications are used with clear direction to ensure students do not get drawn into parts that are less relevant. A mix of media such as computer and role-play with close to live characters encourages engagement.

Disciplines
Arts and Humanities | Social and Behavioral Sciences

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Zinc Violet, case studies in the use of an advanced teaching tools in widely different settings

Kreis IA, Leonardi GS, Zielhuis G,
Heijke L, Stace R

Basic questions

- Why do we need cost-efficient teaching?
- Why need to use materials (of any kind) in different settings?
- Why use advanced teaching tools?

Why advanced teaching tools?

- More fun?
- Better / advanced learning?
- Ultimately cheaper (fewer projects, better prepared for projects)?

How does it work?

- The student is placed within a complicated, simulated ‘world’
- Students construct their own approach to the problem
- Possible to take various routes through the material
- The class reflects on all the possible routes

The theory on 'constructivist' teaching

- Students construct strategies to tackling problems
- Students get to internalise their skills and knowledge
- The teacher helps students to reflect and learn

The theory

- 'learners … are able to invent their own personal assumptions and its law'
- 'they can shape the reality, modify it and build alternatives'
- 'by exploring … they learn to transfer habits of exploration from their personal lives to the formal domain of scientific theory construction' [Papert, 1980]

So, why is there a problem doing this?

- The development of advanced teaching tools using simulation is costly
- It is often of limited value to the institution developing it
- Thus the investment can only be regained if the teaching tool can be used
  - in other places and/or
  - a wide range of applications.

So,

Assuming we do not have access to a wide market, we may need to optimise the use of the expensive teaching tool. So,

The objective is to assess the usefulness of an advanced teaching tool in a range of setting and cultures

An example

Essential characteristics

- Extremely rich data set
- Real life simulation
- Students must make choices, due to time / money budgets
- Complete simulation of professional role
  - Defend choices in public meetings with role play
  - Report using professional formats

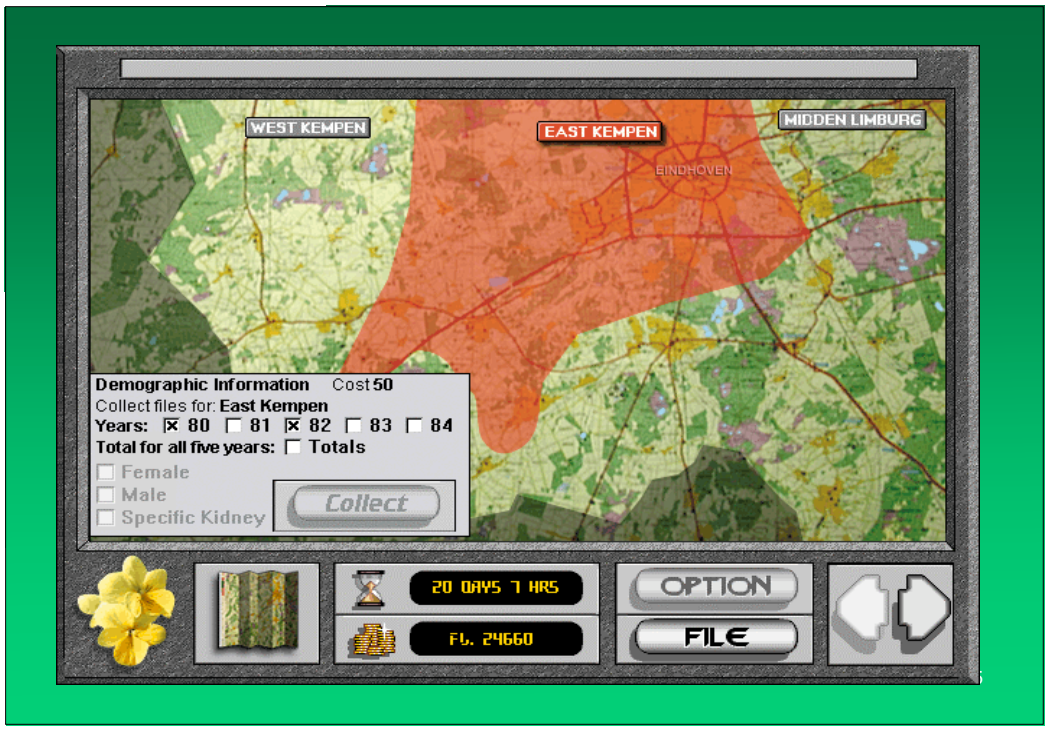
Moving through the ‘world’

- Some structuring for ease of navigation
- Four stages
  - Exploration
  - Initial investigations
  - Study design
  - Study analyses
- Some assistance is available in tutorials

What does it look like?


Mr Q. Smit
Director,
Budel Zinc Factory
Dr O. Versee
Regional Inspector of Health,
Province of North Brabant
Professor S. Cience
Professor of Health Sciences,
University of Amsterdam
Dr B. Crate
Environmental Health Officer of the
Council of Budel
Members of the Council of Budel


Health Data and Analysis
Options 1 to 4 from a total of 6
Eersel
ca. 12,000 inhabitants
Cultural centre of the Kempen townships with an old heritage protected village centre and the Kempen museum. Habitation of the site has dated back to the 6th or 7th century. The town was recognised as a cultural and economic centre in 1325 by the Duke of Brabant, also the site for the sculpture 'Man from the Kempenland, a satisfied man', indicating the basic attitude of the
Picture 1
CLOSE
20 DAYS 7 HRS
FL. 24660
OPTION
FILE


WEST KEMPEN
EAST KEMPEN
MIDDEN LIMBURG
EINDHOVEN
Demographic Information Cost 50
Collect files for: East Kempen
Years: 80 81 82 83 84
Total for all five years: Totals
Female
Male
Specific Kidney
Collect
20 DAYS 7 HRS
FL. 24660
OPTION
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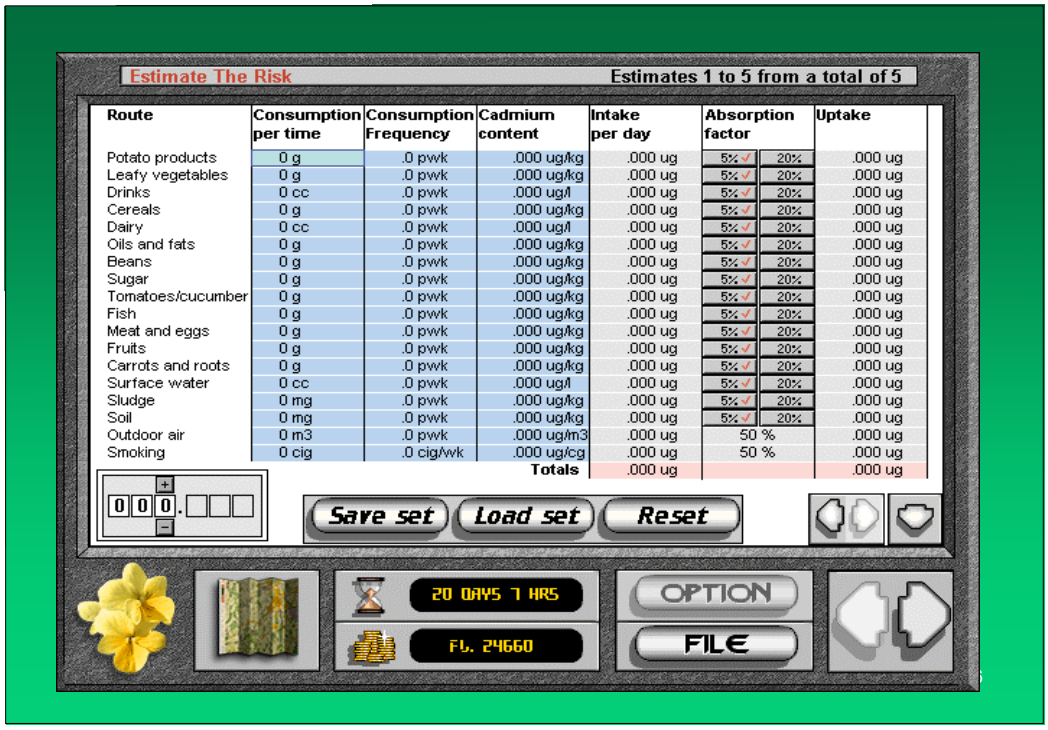
Estimate The Risk
Estimates 1 to 5 from a total of 5
Route | Consumption per time | Consumption Frequency | Cadmium content | Intake per day | Absorption factor | | Uptake
Potato products | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Leafy vegetables | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Drinks | 0 cc | .0 pwk | .000 ug/l | .000 ug | 5% | 20% | .000 ug
Cereals | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Dairy | 0 cc | .0 pwk | .000 ug/l | .000 ug | 5% | 20% | .000 ug
Oils and fats | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Beans | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Sugar | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Tomatoes/cucumber | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Fish | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Meat and eggs | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Fruits | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Carrots and roots | 0 g | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Surface water | 0 cc | .0 pwk | .000 ug/l | .000 ug | 5% | 20% | .000 ug
Sludge | 0 mg | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Soil | 0 mg | .0 pwk | .000 ug/kg | .000 ug | 5% | 20% | .000 ug
Outdoor air | 0 m3 | .0 pwk | .000 ug/m3 | .000 ug | 50 % | | .000 ug
Smoking | 0 cig | .0 cig/wk | .000 ug/cg | .000 ug | 50 % | | .000 ug
Totals .000 ug .000 ug
000.
Save set
Load set
Reset
20 DAYS 7 HRS
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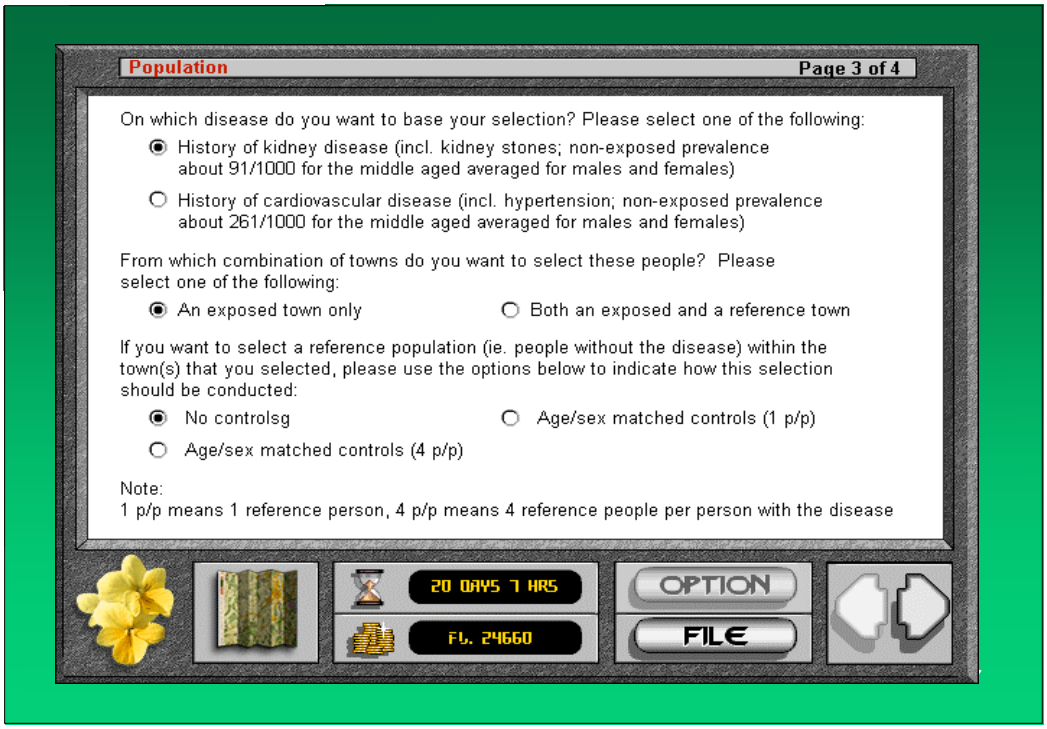
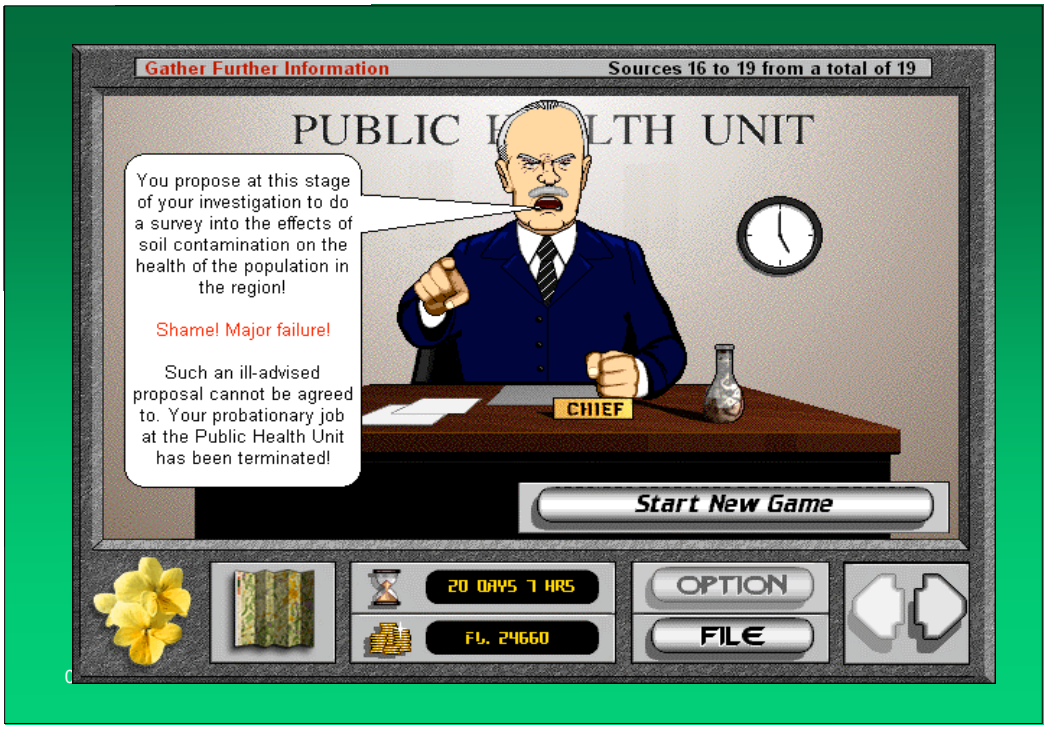
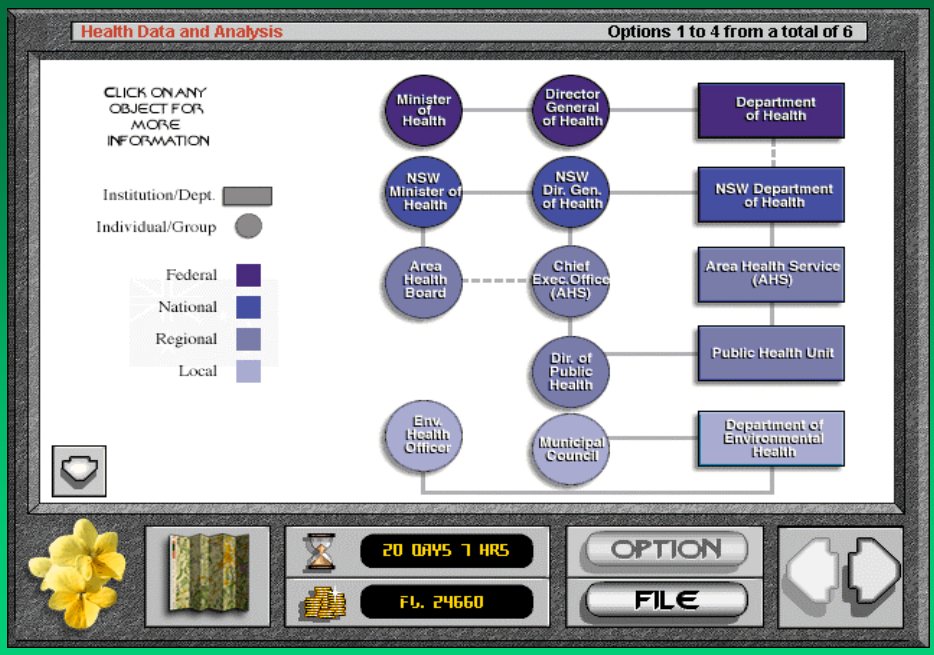

Population
Page 3 of 4
On which disease do you want to base your selection? Please select one of the following:
History of kidney disease (incl. kidney stones; non-exposed prevalence about 91/1000 for the middle aged averaged for males and females)
History of cardiovascular disease (incl. hypertension; non-exposed prevalence about 261/1000 for the middle aged averaged for males and females)
From which combination of towns do you want to select these people? Please select one of the following:
An exposed town only
Both an exposed and a reference town
If you want to select a reference population (ie. people without the disease) within the town(s) that you selected, please use the options below to indicate how this selection should be conducted:
No controlsg
Age/sex matched controls (1 p/p)
Age/sex matched controls (4 p/p)
Note:
1 p/p means 1 reference person, 4 p/p means 4 reference people per person with the disease
20 DAYS 7 HRS
FL. 24660
OPTION
FILE


Gather Further Information
Sources 16 to 19 from a total of 19
PUBLIC
LTH UNIT
You propose at this stage of your investigation to do a survey into the effects of soil contamination on the health of the population in the region!
Shame! Major failure!
Such an ill-advised proposal cannot be agreed to. Your probationary job at the Public Health Unit has been terminated!
CHIEF
Start New Game
20 DAYS 7 HRS
FL. 24660
OPTION
FILE



Where does it get used?

- Usually as epidemiology, once risk communication
- Mostly Master of Public Health, often last subject
  - Wollongong (Oz), mostly international (post-medical) students
  - Nijmegen (Nl), mostly Dutch (health sciences, occ health, toxicology) (now also international)
  - Amsterdam (Nl, NSPOH), mostly acute care
  - London (UK, LSHTM), mixed origin students
  - Health Protection Agency (Chilton, UK) internal course for toxicology / env.scientists

Who have been the students?

- Australia, China, France, India, Ireland, Italy, Netherlands, Nigeria, Pakistan, PNG, Taiwan, UK and other countries.
- Physicians, nurses, environmental scientists, toxicologists and dieticians.

What were the course labels?

- Applied epidemiology
- Environmental epidemiology
- Public health investigation
- Risk assessment & risk communication

What works well?

- Students commit to their own solution
- Coming to terms with other solutions challenging
- Students combine stats and epi books info
- Discussions / role-play are very animated
- Students learn to make decisions
- Students learn to report professionally
- Nightmares have been reported!

What works 'awkwardly'?-1

- Many, have limited gaming experience so many navigation clues missed
  - Requires active guidance in laboratory
- Feeling dumped in the deep and objecting to too little guidance
  - Usually get the aim in the end
  - Requires active attendance of professional help in the lab
- Short CPD courses: too complex to get it finished

What works ‘awkwardly’?-2

- Technical aspects
  - Old DOS-base (+floppies) vs new Web-image
- Navigating aspects
  - Renewed look confuses (no clear arrows)
- Presentation aspects
  - Lengthy discussion possible about the role of ‘errors’ (but not typos)

What are the limitations?

- Such tools need extremely extensive data and a complex situation
- Expensive to create + maintain (+ copyright issues)
- Hard on teacher: refrain from lecturing / instructing or intervening / guiding
- Students need to have basic knowledge to be able to cope
- Needs to be used in intended context (?)

Conclusion -1

- Many evaluations
- Simulations facilitated very good engagement
- Research applications were highly successful
- Continuous technical updating is essential as 'bugs' were found to be irritating and IT moves so fast
- Risk communication application
  - The first half of the simulation worked
  - Clear explanation needed but for that part they were engaged

Conclusion -2

- As intended so as env. epi:
  YES
- As risk communication case-study:
  LESS WELL
- Within the ‘right’ context ‘non-local location’ and ‘old-age’: NOT AN ISSUE

Where to now?

- More tools need to be developed
- Teachers need to collaborate
  - due to cost/ time development required
  - large data sets are rare
- Invest in few rich, well-designed ‘worlds’ rather than many simple simulations
  - tools do not need to be ‘localised’

Thus,

- If assured of consistent supply of students
- For specific (high) level courses

- Good teaching tools could pay off

Acknowledgement / team

- Team: researcher, programmer, designer, educational consultant, local organisers
- Research (started 1984, PhD 1992)
- First version: University of Nijmegen
- Data: RIVM, CBS, SIG, SOOZ, Eurocat
- $$: Gov. Australia, Uni. Wollongong
- Many others