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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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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?
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...
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 291/1000 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 (i.e., 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 controls
- 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.
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