Semantic Waves
Analysing the Effectiveness of Computing Activities

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Background

• Computing is now being taught in schools worldwide

• There is little experience of solid pedagogy

• We need simple tools to help judge the effectiveness of learning activities

• Semantic waves give an educational tool that may help
Semantic Waves

- An educational theory by Maton (2013), http://legitimationcodetheory.com/:
  - a simple but powerful theory of how to teach concepts.

- It has been successfully applied across MANY disciplines.

- A way to think about what a good explanation / learning experience is
  - whether written, multimedia or spoken.

- A way to think about why metaphor and unplugged teaching works (and why sometimes they might not).

- It can be used as a way to evaluate lesson plans, online resources, and as a way to teach students how to write good explanations.
A good learning experience follows a wave pattern

Abstract Concepts, Technical Language
(What we are trying to explain)

Link back to the abstract ideas

Concrete things

Examples
Diagrams
Metaphors
Similies

Explain in terms of concrete things

Its like a …

Everyday language

Things our reader already knows well or can easily understand

Time passing as we read or listen to the explanation
Method

• We applied semantic wave theory to two (more recently more) activities / approaches to teaching programming

1. The cs4fn / Teaching London Computing unplugged activity:

   "Box Variables"

   • an activity that has been very effective over many years

2. A “copy code” activity

   • suggested as an ineffective way to teach programming

• We also asked teachers to draw the wave structure of activities while they happened as part of a CPD session.
Findings

• The Unplugged activity had a “good” wave within wave structure that unpacked and repacked concepts repeatedly.

• The copy-code activity had a “poor” flat-lining down escalator structure with no unpacking or repacking.

• In both cases the reflecting on the wave structure suggested improvements

  • eg adding a student repacking activity at the end of the Box Variables activity
Box Variables: Waves within waves

Hard to understand

Abstract Concepts
Technical Language

learning outcomes

example program

explain each line of code as act it out

What we are trying to explain

Easier to understand

Concrete things
Everyday language

box + shredder + copier

introduce role play

Things the learner can easily understand

Easy to understand

Learning outcomes

box + shredder + copier

introduce role play

Things the learner can easily understand

Time passing through the learning experience

Teacher overviews

BETTER if students summarise first
The Copy Code Activity: Stepped Down Escalator

Abstract Concepts
(What we are trying to explain)

Concrete but technical example in technical language

Easy to understand

Explain task

See the effect of the example in the real world (the picture)

Hard to understand

(Things the learner can easily understand)

Time passing through the learning experience
Conclusions

• Semantic Waves provide a quick and simple but powerful way to evaluate learning activities

• It gives insight into why they may work or not

• It supports reflective changes to improve activities

• Teachers were able to plot wave structure of activities while watching them
References


Thank you…
Questions?

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