Learning about and learning through Empirical Modelling

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Papert (1993)

• “I am convinced that the best learning takes place when the learner takes charge”
• “The role of the teacher is to create the conditions for invention rather than provide ready-made knowledge”


Papert (1991)

• Constructionism is the idea that learning occurs “in a context where the learner is consciously engaged in constructing a public entity”


Riley (1990)

• “These experiences [from Computers in the Curriculum Project] have led to the belief that students too, would learn more or understand better if they researched and developed their own computer models.”


Learning about EM

• What is EM and where did it come from?
  – Using computers for sense-making activities (e.g. model building and exploration)
  – Principles and tools developed at Warwick by Meurig Beynon, Steve Russ and many others
• What are the applications for EM?
  – Software engineering, concurrency, graphics, artificial intelligence, and… education

The basics of EM

• Construction of models leads to personal understanding
• Correspondence between world and computer – models with meaning

• Key ideas:
  – Exploratory environment for model building, extension and refinement
  – Observables, dependency and agent actions
EM module

- Computer Science 4th year module: “Introduction to Empirical Modelling”
- Started in October 2002
- Module assessment is through examination and coursework
- Changed the style of coursework in 2004 to include the publication of an online journal requiring students to submit papers and models

The coursework: WEB-EM

- Warwick Electronic Bulletin on Empirical Modelling
- Issued a Call for Papers requiring two submissions:
  - a paper title and abstract (part 1)
  - full paper and accompanying model (part 2)
- Requested that “students submit original and high quality papers relating to EM and its applications supported by a relevant documented modelling study”

WEB-EM objectives

- To assess the students’ understanding of Empirical Modelling through written and modelling exercises based on a common theme of the students’ own choice
- To equip the students with basic research skills that would be useful in further education

Example: Non-decimal bases

Example: Traffic lights

Example: Grid computing
The coursework has shown that:

- Learning can occur and skills can be developed without a preconceived objective
- Learning is stimulated by personal interest
- Learning is reinforced when practice and principles are combined
- Learning is aided by exploration

Did the coursework meet the objectives?

- Answer: Probably

But what else did the students learn?
Concluding remarks

- Questions to be asked:
  - Did students only learn about Empirical Modelling?
  - What learning occurred in domains other than Empirical Modelling?
  - What role did the journal style of coursework play in encouraging learning in other domains?
  - What role did the tools play in enabling learning in other domains?
  - Can EM be used more generally for learning?