

Towards Technology for Learning in a Developing World

Meurig Beynon

*Computer Science
University of Warwick
Coventry, UK
wmb@dcs.warwick.ac.uk*

TEDC 2006

Content of the talk

- An experiential framework for learning
- Closed learning
- Radical Empiricism
- 'understanding backwards and forwards'
- Conjunctive relations
- Empirical Modelling

TEDC 2006

private experience / empirical / concrete

interaction with artefacts: identification of persistent features and contexts
practical knowledge: correlations between artefacts, acquisition of skills
identification of dependencies and postulation of independent agency
identification of generic patterns of interaction and stimulus-response mechanisms
non-verbal communication through interaction in a common environment
directly situated uses of language
identification of common experience and objective knowledge
symbolic representations and formal languages: public conventions for interpretation

public knowledge / theoretical / formal

An Experiential Framework for Learning (EFL)

TEDC 2006

From top to bottom of the EFL

- from the private to the public
- from the subjective to the objective
- from the provisional to the assured
- from the particular to the general
- from the pre-articulate to the conceptual and symbolic

*Importance of such transitions recognised,
but educational technology doesn't promote*

TEDC 2006

Closed learning

- associated with the bottom of the EFL
- "what can be learnt is what can be taught"
- can be identified with core elements of science, engineering and management
- a view of learning characteristic of the "developed" world
- presumes a transition from top to bottom has been made prior to learning

TEDC 2006

Beyond closed learning

- significance recognised, but not enabled by educational technology as conceived
- tend to view *instruction* and *construction* as alternative paths to the same goal:
cf. 'exploratory' & 'expressive' modelling
- learning activities at the top of EFL can't be observed through the lens and filter of the objective, the rational and the symbolic

TEDC 2006

Beyond closed learning

- learning activities at the top of the EFL have affinity with the arts & humanities
 - technologies to support exist in practice (e.g. in software for graphic art, music)
- BUT these are not well-supported by our accepted conception of computing, which favours rules, methods and objects that pervade developed worlds ...*

TEDC 2006

Radical Empiricism (RE)

- “a philosophic attitude” William James (1910)
- RE has suffered criticism and neglect
- RE invokes the word 'experience' to refer exclusively to what is given moment-by-moment in the perception of a person
- what is given in experience is more than discrete sensory elements – it encompasses *relationships of a conjunctive nature*

TEDC 2006

Understanding backwards

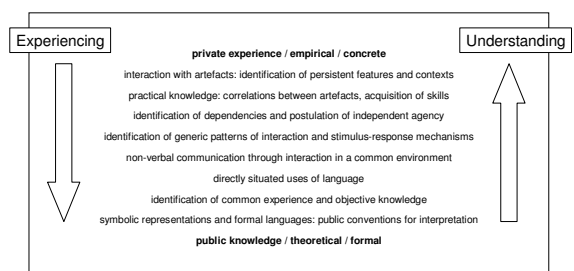
Kierkegaard:

'we live forwards, but we understand backwards'

William James:

“Understanding backwards is, it must be confessed, a very frequent weakness of philosophers, both of the rationalistic and of the ordinary empiricist type ...”

TEDC 2006



“Understanding backwards” and the EFL

TEDC 2006

James on Kierkegaard

Kierkegaard:
'we live forwards, but we understand backwards'

William James:

“Understanding backwards is, it must be confessed, a very frequent weakness of philosophers, both of the rationalistic and of the ordinary empiricist type. [RE] alone insists on understanding forwards also, and refuses to substitute static concepts of the understanding for the transitions in our moving life.”

TEDC 2006

How RE regards knowledge

- RE sets out to relate all knowledge and understanding to its origin in personal experience
- contends that all knowledge is ultimately rooted in the perception of conjunctive relations
- puts the primary focus on personal, private and subjective activities

TEDC 2006

Conjunctive relations

connections between experiences that are directly given in personal experience

cf. there is an unavoidable discontinuity in my experience "when I seek to make a transition from an experience of my own to one of yours ... [I] have to get on and off again, to pass from the thing lived to another thing only conceived"

TEDC 2006

Examples of conjunctive relations

"connections between experiences that are directly given in personal experience" – as is the relationship:

- between an object's location and its shadow
- between notes of a musical score and keys on a keyboard
- between a name and a pet animal
- between two experiences of the same place at different times
- between experiences of two places on the same journey

TEDC 2006

Nature of conjunctive relations

- highly personal in nature
- dependent on context and observer
- operating in the realm of the pre-articulate
- in need of no additional explanation
- having extremely broad semantic content

... qualities particularly relevant to learning activities outside the scope of closed learning

TEDC 2006

"If from the top of a long cold barren hill I hear the distant whistle of a thrush which seems to come up from some warm woody shelter beyond the edge of the hill, this sound coming faint over the rocks with a mingled feeling of strangeness and joy, the idea of the place about me, and the imaginary one beyond will all be combined together in such a manner in my mind as to become inseparable."

From an essay by Hazlitt (1835)

TEDC 2006

Motivating Empirical Modelling

- complementing rather than compromising those attitudes and attributes of the developing world that defy closed learning
- privileging personal agency for exploration and experiment
- supplying principles and tools to liberate the personal elaboration of conjunctive relations

TEDC 2006

Empirical Modelling (EM)

Body of principles, tools and models developed at the University of Warwick over 15-20 years, primarily through graduate theses and undergraduate projects

For more background, see

<http://www.dcs.warwick.ac.uk/modelling>
and posters on educational themes at
<http://empublic/projects/beynonKaleidoscope2005>

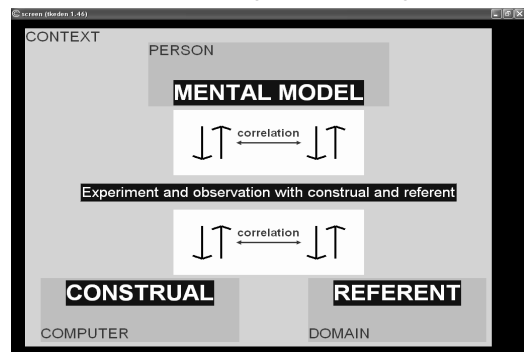
TEDC 2006

Underlying principle of EM

The modeller fashions a conjunctive relation between experience of interacting with a computer-based artefact (to be called the modeller's **construal**) and a complementary experience to which the artefact refers (to be called its referent)

TEDC 2006

Model making as construing



TEDC 2006

Practice of EM

- artefact is developed as a family of definitions – a *definitive script* – whose variables are the counterparts of observables in the referent
- model-building is incremental, creative, iterative and experimental in character
“modelling with definitive scripts”

TEDC 2006

Linking the RE and EM agendas

- RE: accounting for all phenomena with ultimate reference to conjunctive relations apprehended in personal experience
- EM: accounting for even the most complex forms of concurrent systems modelling by modelling with definitive scripts

TEDC 2006

Characteristics of EM ...

- EM is much closer in spirit to modelling with spreadsheets than to programming
- it is similarly well-oriented to educational use, especially in a constructionist idiom
- EM artefacts are always open to extension and reinterpretation, constrained only by what the modeller can effect and imagine

TEDC 2006

Concluding remarks

The undeveloped and developing world as the natural habitat of Empirical Modelling:

- programming as the counterpart of railway engineering, management and use
- EM as akin to walking or bird-watching ... activities where awareness and human engagement are of the essence

TEDC 2006