



Teaching-learning environments to support deep learning in contrasting subject areas

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Enhancing teaching-learning environments in undergraduate courses (ETL project) Ideas underpinning the research design

- ❖ Research into teaching and learning in higher education needs to be related to disciplinary knowledge
- ❖ Conceptualisations of disciplinary pedagogy need to bring together good practice with underpinning theory
- ❖ Research into student learning provides a set of concepts to describe how students learn and study
- ❖ Students' approaches to studying are affected by different kinds of teaching and assessment and these help to explain differences in academic performance

Project web site - <http://www.ed.ac.uk/eti>

ETL project Research objectives

- ❖ Work with colleagues in five subject areas to explore teaching and learning in their discipline
- ❖ Explore how teaching-learning environments in each subject area help or hinder student learning
- ❖ Analyse questionnaires and interviews to identify problems highlighted by students
- ❖ Use this evidence, along with conceptual frameworks, to negotiate possible adjustments to the teaching-learning environment, and evaluate their effectiveness

Emerging outcomes from the ETL project

- ❖ Generic descriptions of teaching and learning can be used to guide discussions in specific disciplines, but ...
- ❖ The nature of the subject area necessitates important changes in their detail and implications for teaching
- ❖ *Ways of thinking and practising in the subject* prove a good starting point for deciding what is distinctive in what students are expected to learn & how they study
- ❖ Evidence from students helps to clarify what may be interfering with their ability to learn effectively and so indicates ways of enhancing the t-l environments

Scope of the project

- ❖ Five contrasting subject areas
Electronic engineering, biological sciences,
economics, history & media studies
- ❖ 17 departments in different types of university
- ❖ In most departments, working with colleagues in first & final year modules

Main concepts

- ❖ Teaching-learning environment
- ❖ Ways of thinking & practising in the subject
- ❖ Threats to understanding
troublesome knowledge threshold concepts
- ❖ Conceptions of learning/approaches to studying
- ❖ Students' perceptions of the t-l environment



Ways of thinking and practising - 1

- ❖ **Electronic engineering**
Circuit analysis using many examples and transforms to produce intuitive understanding and so design circuits
- ❖ **Biological sciences**
Design of experiments and thinking with evidence to build up 'inter-connective and synoptic understanding'
- ❖ **Economics**
Concepts, models and graphs derived from evidence used to analyse and explain the real-world events

Ways of thinking and practising - 2

- ❖ **History**
Use of evidence and argument to explain events and processes within their historical and cultural context, recognising the contested nature of the explanations
- ❖ **Media studies**
Recognition of the power of the media to affect how people think and the need to be aware of the effects of social context and individual status on interpretation

Threats to understanding Threshold concepts

A threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding... or viewing something without which the learner cannot progress. [For example,] if **opportunity cost** is 'accepted' by students as a valid way of interpreting the world, it fundamentally changes their way of thinking about their own choices, as well as serving as a tool to interpret the choices made by others.

(Meyer & Land, 2003, see web site)

Conceptual framework - from organisational theory

Soft systems methodology *Peter Checkland*

- ❖ Find out about the problem situation
- ❖ Model how activities influence outcomes
- ❖ Debate changes likely to improve the situation
- ❖ Negotiate between conflicting interests
- ❖ Take action and monitor its effectiveness

Conceptual frameworks - from research on student learning

- ❖ **Constructive alignment** *John Biggs*
Align high-level (constructivist) aims with students experience, teaching, assessment and feedback
- ❖ **Teaching for understanding** *David Perkins*
Understanding aims, throughlines, generative topics, understanding performances
- ❖ **Influences on student learning** *ETL team*
(later slide)

Constructive alignment

A good teaching system aligns teaching method and assessment to the learning activities stated in the objectives, so that all aspects of this system act in accord to support appropriate learning. This system is called constructive alignment, based as it is on the twin principles of constructivism in learning and alignment in teaching

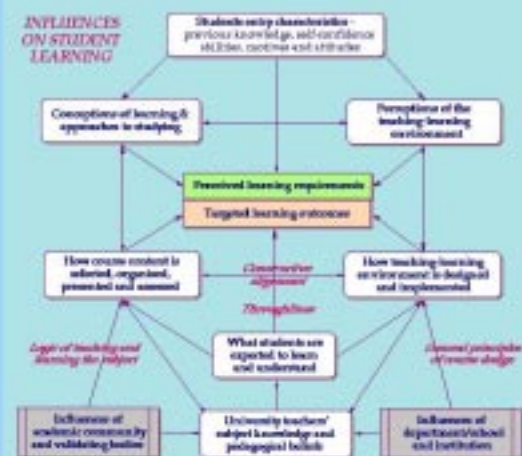
Biggs (2003) p. 11

Throughlines

Throughlines reflect what teachers believe is most important for students to learn in their course. This goal is set out clearly and revisited regularly during the course to keep it firmly in students' minds as they work through topics.

Throughlines is an analogy taken from 'method acting' where a fundamental theme is used by actors to focus the portrayal of their characters.

(adapted from Wiske, 2003, p. 11)



Conceptions of learning



Approaches to learning and studying

- ❖ **Deep approach** - seeking meaning
- ❖ **Surface approach** - reproducing content
- ❖ **Strategic approach** - directed study effort

Ference Marton, Noel Entwistle and Paul Ramsden

Intention -> learning strategies -> outcomes

Approaches become habits but still depend on the teaching and assessment. So students vary in their approach across courses.

Deep approach to learning

Intention - to understand ideas for oneself

Learning strategies and processes

Relating ideas to previous knowledge and experience

Looking for patterns and underlying principles

Checking evidence and relating it to conclusions

Examining logic and argument cautiously and critically

Memorising whatever is essential to understanding

Monitoring understanding as learning progresses

Outcome - feeling satisfaction and growing interest

Deep processes in contrasting subjects

Electronic engineering as an example

Understanding in analogue engineering depends on recognising the way in which the components within a circuit change the nature of the output and recognising the relationships between quite different representations of the physical circuit - the circuit diagram, the groupings of components having distinct functions, the mathematical transforms used to simplify the circuits, the algebraic manipulations necessary to determine the output, and the engineering implications of the values obtained. A deep approach depends on having an intention to understand what underlies the circuit and putting together all the component processes in an effective way in carrying out the analysis.

Extract illustrating a deep approach

Electronic engineering as an example

There is a great deal to cover, and I am not satisfied unless I really understand what we're given. I take quite full notes, but afterwards I go through them and check on things which I'm not clear about. Once you realise what lies behind the problems - that's the physics of it and what makes it a problem - then you can do them. You get a kick out of it too, when it all begins to make sense. Applying the right formula is not difficult, once you know you are on the right lines.

Surface approach to learning

Intention to pass without too much effort or thinking

Learning strategies and processes

Treating the course as unrelated bits of knowledge

Routinely memorising and carrying out procedures

Focusing narrowly on the minimum syllabus demands

Seeing little value or meaning in the course or set tasks

Studying without reflecting on either purpose or strategy

Outcome feeling anxious and under undue pressure

Extract illustrating a surface approach

I suppose I'm mainly concerned about being able to remember all the important facts and theories that we've been given in the lectures. We are given an awful lot of stuff to learn, so I just plough through it as best I can. I try to take it all down in the lectures, and then go over it until I'm sure they won't catch me out in the exams... (With the problem sheets,) the first step is to decide which part of the lecture course the problem comes from. Then I look through my notes until I find an example that looks similar, and I try it out. Basically, I just apply the formula and see if it works. If it doesn't, I try a different formula.

Strategic approach to studying

Intention to do well and/or achieve personal goals

Learning strategies and processes

Organising studying thoughtfully

Managing time and effort effectively

Forcing yourself to concentrate on work

Being alert to assessment requirements and criteria

Monitoring the effectiveness of ways of studying

Outcome satisfying your responsibility to self / others

Extract illustrating a strategic approach

I try to think ahead when I'm studying. I know what has to be done and I make sure I can get hold of whatever I need to do it. I think I'm fairly good at concentrating, unless I'm quite tired, and I make sure I finish what I have to do before doing other things. I try to look over the lectures from time to time and when it comes to the exams I make summary notes of what seem to be the key topics to make sure I'm ready for what they're likely to ask. In the exams, it's a bit like a performance, being on a stage; not necessarily knowing a vast amount, but having to perform well with what you do know.

Students' perceptions of the teaching-learning environment

Factor analysis of a questionnaire produced four groups of items

- ❖ Overall reaction to the course unit
- ❖ Course organisation and management
- ❖ Teaching that helps learning
- ❖ Support and encouragement

Further details and the questionnaire are on the project web site

Perceptions of the course unit

Overall reaction to the course unit

Interest, enjoyment and relevance

I found most of what I learned in this course unit really interesting

Course organisation and management

Clear aims and organisation

It was clear to me what we were supposed to learn in this course

Alignment and integration

What we were taught matched what we were supposed to learn

Choice in what and how to study

Perceptions of the teaching

Teaching that helps learning

Teaching for understanding

The teaching helped me to rethink my understanding of the subject

Assessment for understanding

To do well in this course you had to think critically about the topics

Guidance and feedback on assessment

The feedback helped me to clarify things I hadn't fully understood

Perceptions of the support provided

Support and encouragement

Staff enthusiasm and support

Staff tried to share their enthusiasm for the subject with us

Staff were patient in explaining things that were difficult to grasp

Support from other students

Students supported each other and tried to give help when needed

Talking with other students helped me develop my understanding

Differing levels of understanding

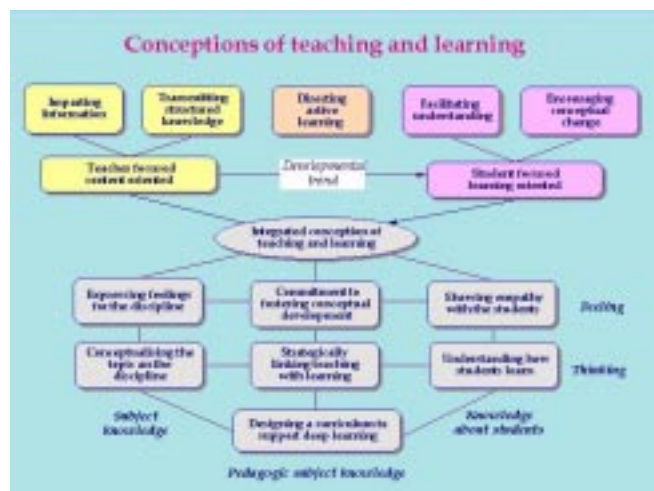
Understanding involves the integrating and inter-relating of ideas and evidence. The level reached is shown by:

- ❖ **Breadth** - how much material is integrated
- ❖ **Depth** - the extent to which connections between ideas, and with evidence, are explored
- ❖ **Structure** - the extent to which the logical structure of the material is convincing and original

See Entwistle (1998)

Different levels of understanding in essays

- ❖ **Mentioning** - incoherent bits of information without any obvious structure
- ❖ **Describing** - brief descriptions of topics derived mainly from material provided
- ❖ **Relating** - outline explanations showing links but weak in detail or supporting evidence
- ❖ **Explaining** - using relevant evidence to develop structured, independent arguments
- ❖ **Conceiving** - showing a broader understanding of ways of thinking in the subject area



Good lecturing

described by an engineering student

Lecturers must tap into a core of enthusiasm and be able to put across difficult concepts in ways that can be easily understood.

It requires a knack for example and analogy, a feel for how a concept looks to a student who does not yet understand.

If lecturers monitor their audience's reaction, they will avoid boring them with needless elaboration or confusing them with too brief an example.

From O'Brien (THES, March 26, 2004)

How can teaching be made more effective?

- ❖ Have a clear idea of what students know already
- ❖ Set out the main idea clearly and use throughlines
- ❖ Show enthusiasm for topic and how it fits into the subject
- ❖ Explain concepts fully and clearly, with varied examples
- ❖ Set assignments based on relevant problems or issues
- ❖ Provide opportunities for active, collaborative learning
- ❖ Give prompt and helpful feedback on students' work
- ❖ Spread out assessment and use varied methods
- ❖ Reflect carefully on student feedback and act on it

Relative helpfulness of learning activities

based on the 'logic of teaching and learning' analogue

Mean ratings on 1 -7 scale	Unit A	Unit B
The way diagrams presented	5.0	5.3
Ideas explained in lectures	4.3	5.6
Lecture explanations of problems	4.2	5.8
Worked examples provided	5.0	3.6
Working on problems on own	5.2	4.6
Using a 'log-book' to note difficulties	4.2	4.3
Staff help in tutorials	5.0	4.0
Discussions with other students	4.8	4.7
Feedback on work submitted	3.5	3.6
Class tests and the results	4.3	4.2

Indirect influences on teaching and the quality of learning

EXTERNAL INFLUENCES	INSTITUTIONAL INFLUENCES
Popularity of the subject	Student intake
External validation	Level of RAE and other funding
Subject benchmarks	Quality assessment and performance indicators
Teaching conventions	Regulation of assessment etc.
Employers' views	Competing pressures on staff