Current trends in interactive teaching and student-centered learning.

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Overview.

• Research findings
• Is traditional teaching ineffective?
• Alternative teaching strategies
• Evaluating one teaching strategy
• Mixing and matching teaching strategies

What does research inform us?

Students retain:
– 10% of what they read
– 26% of what they hear
– 30% of what they see
– 50% of what they see and hear
– 70% of what they say
– 90% of what they say as they do something

Students need to be actively involved in learning to retain any content and to understand concepts.


In addition, concentration in lectures drops off after 20 minutes!

Research findings (continued)

• Particular teaching strategies can be developed to take account of these findings.
• There has also been a lot of research into science specific learning difficulties.

Misconceptions research

• Many students hold “Aristotelian” concepts of nature.
• Examples: motion implies force, bigger agents = bigger effects.
• These concepts are deeply held, difficult to change and often internally contradictory.
Misconceptions research

- Many misconceptions are extremely widespread.
- Much work has been done to identify and catalogue the most common ones.
- Important work is being done on student misconceptions in different cultures.

Diagnostic tools for misconceptions

- These are possible because there are only a small number of common misconceptions.
- They consist of a series of multiple choice questions, with the right answer is hidden among tempting distracters.

Diagnostic tools for misconceptions

- Several researchers in physics have developed these “concept inventories”.
- The best known are the Force Concept Inventory (1992) and the Maths & Physics Concept Evaluation.
- These have been administered many times and reported in the literature.

Research findings about misconceptions

- These misconceptions are usually very firmly held by students and extremely difficult to change.
- Even students who can pass conventional exams often score badly on misconception diagnostics.
Research findings about misconceptions

- Many students who can pass conventional exams score badly on misconception diagnostics.
- Traditional lectures leave many misconceptions unchanged.

Targeted teaching techniques

- Some special teaching techniques target individual misconceptions.
- They make students confront their incorrect beliefs and change them.
- Example: POE (Predict, Observe, Explain).
- Successful strategies involve active learning.

What do we conclude from this?

- Conventional teaching seems to be an ineffectiveway of getting students to learn.
- Particularly in science, there is a need to concentrate on the kind of teaching that promotes active learning.

How do we develop active learning?

- Cooperative learning groups
- Flexible learning opportunities
- Student friendly learning environments
- Active learning in structured teaching time

We need to think differently about the classic delivery format of science teaching. Move from passive student involvement to active student involvement.

But how?
Cooperative Learning
This is a structured, systematic strategy in which small groups work towards a common goal.
One of the advantages is the development of core generic skills:
– Citizenship
– Sense of community
– Appreciation of diversity
– Critical thinking
– Writing skills
– Oral communication skills
– Numeracy and scientific knowledge

Cooperative learning strategies
• **Think pair share**
  – Used in lectures; students reflect on an issue and then share with a peer
• **Scripted cooperation**
  – Useful in lectures; every 20 mins lecturer asks students to sum up on the material so far
• **Constructive controversy**
  – Useful in tutorials; mini debates – with two pairs of students; topics need to be controversial
• **Group investigation**
  – Useful in tutorials and lab classes; teams plan and perform an investigation; present to whole class

Flexible learning…..
Expands choice on what, when, where and how people learn.
Supports different learning styles, including e-learning.
Means anticipating, and responding to the ever-changing needs and expectations of clients (enterprises, learners, communities).
Our world today demands a flexible approach between working requirements and study commitments.

Advantages of flexible learning
• Time and/or place of study
• Learning styles and preferences
• Contextualised learning
• Access
• Pace
• Progression
• Learning pathways

Teaching pedagogies with flexible learning
Compared with traditional educational models, flexible learning is characterised by:
• Less reliance on face-to-face teaching
• Greater reliance on high quality learning resources
• Greater opportunities to communicate
• An increasing use of information technology
• Deployment of multi-skilled teams

Underpinning flexible learning is a student-centred approach to T&L. This requires different teaching methods and a different relationship between teacher and student.

E-Learning
E-learning is a component of flexible learning.
Has a wide set of application and processes
Includes computer-based learning, web-based learning, virtual classrooms and digital collaboration
Encompasses a range of technologies (Internet, email, chat, newsgroups, text, audio, video conference) delivered over computer networks to deliver education and training both remotely and in the classroom.

*Blended learning (mixed mode) is a mix of face-to-face and e-learning methods.*

Distinction between technology and approach: e-learning is about technology while flexible learning is a philosophy and an approach, in which technology is an important component.
Learning environments

- Safe learning environments
  - Enable students to make mistakes during the learning process
  - Encourage trying out new ideas
- Virtual Learning Environments (VLEs)
  - Student-centred learning space
  - Facilitates all aspects of online learning
  - Has dramatically changed the format of student discussions
  - Research evidence argues this learning space can be as rich and rewarding as the face-to-face space
- Web management tools e.g. WebCT
  - Offer course management of results etc; very useful in large classes
  - Offer a variety of tools to present materials to students (lecture notes, chat, threaded discussion, etc)

Ideas for lectures

Above all, improve student concentration by doing something here.

- Lecture demonstrations
  - Used in physics and chemistry teaching
- Buzz groups
  - Social activity to break up long lectures; helps bring up energy levels
  - Students work in pairs for 2-3 mins; then volunteers report back to whole class
- One minute papers
  - Used effectively at end of lecture; students asked to write down the three most important points of the lecture and hand this in on way out; lecturer reports back next lecture with a summary
- Pyramiding
  - Students work alone at first; then in pairs; then in fours; etc then report back to large lecture group

Last thought – what do employers want in graduates?

A survey of 200 leading European companies indicated:
- Oral communication
- Teamwork
- Enthusiasm
- Motivation
- Initiative
- Leadership skills
- Commitment
- Interpersonal skills
- Organisational skills
- Foreign language competence

(Personal Skills Unit, Sheffield University, 1996)