Active Learning "AL"

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For the slides, references, see:
http://www.psy.gla.ac.uk/~steve/educ/AL.html

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Dewey

- "The emphasis put in this book […] upon activity will be misleading if it is not recognized that the imagination is as much a normal and integral part of human activity as is muscular movement." (*Democracy and Education*, pp. 236-237)

Dewey II

- "… the first approach to any subject in school, if thought is to be aroused and not words acquired, should be as unscholastic as possible…
- …methods which are permanently successful in formal education ... depend ... upon the fact that they go back to the type of the situation which causes reflection out of school in ordinary life. They give the pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking; learning naturally results." (*Democracy and Education*, p. 154)

Dewey III

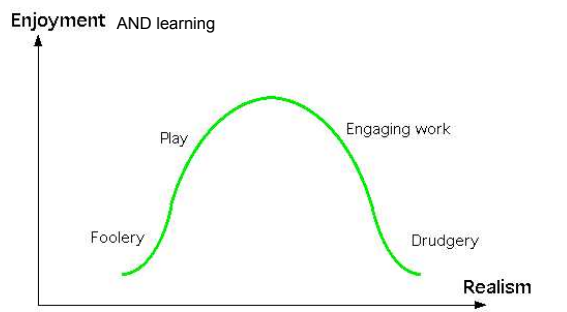
- "…in the classroom, this means teachers must encourage students to find genuine problems which excite their interest, problems which can be explored and ameliorated by engagement with the curriculum."
- Don't have to be doing controlled experiments, but always "squinting, rattling, and thumping". Learning in natural settings requires "interest, effort, and direction" i.e. active participation.

Dewey IV

- "…ideas are learned through use, not passive reception. Ideas cannot be handed over like bricks; pupils must be active and supply the energy for their own learning." (Dewey, *Democracy and Education*, p. 4)

Dewey: Realism & enjoyment.

Work & play. Learning and producing.



Gee

- **Active, Critical Learning Principle**:
  - All aspects of the learning environment (including the ways in which the semiotic domain is designed and presented) are set up to encourage active and critical, not passive, learning.
- For Gee, **three things are involved in active learning**: *experiencing* the world in new ways, forming new *affiliations*, and *preparation* for future learning.

Sanders *et al.*

- Active learning is good
- Term not defined precisely ('not a lecture')
- Often used to describe instructional techniques rather than student learning
- All active learning techniques treated equally

Sanders *et al.*

- Anything that "involves students in doing things and thinking about the things they are doing" (Bonwell & Eison, 1991, p. 7).
  - i.e. doing and reflecting (see Dewey above – giving students something to *do*, which they have to think about and make connections).

Sanders *et al.*

"Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing (Bonwell & Eison, 1991). While this definition could include traditional activities such as homework, in practice active learning refers to activities that are introduced into the classroom. The core elements of active learning are student activity and engagement in the learning process. Active learning is often contrasted to the traditional lecture where students passively receive information from the instructor." Prince (2004)

Sanders *et al.*

- **Four dimensions** along which instructional techniques might differ:

1. How active are they, and what do they do?
2. How reflective are they?
3. How social are they?
4. How specific to computing are they?

(Transition slide)

Dewey emphasised :

1) Arousing thought, not just comprehension or memorisation.

2) The link to ("authentic") activities valued by adults

Both are about concrete action BUT requiring "reflection" i.e. thinking.

Part D:
Joe Maguire's latest "active-ity"

Active learning in the university

The university is vague about this (like the CSE literature); though this may be to leave room for innovative and creative teaching.

In relation to his latest "AL" activity *(paper finished tomorrow)*, Joe points out:

- ALs can address diversity in the class by "jigsaw" cross-teaching, and by letting learners self-select to aspects of a topic which are most interesting to them.
- If you inherit ALs from a course, putting them on may be less work than writing an alternative (that is how old AL is).
- Using AL means activity by learners in class; but also, more work for them in preparing – and whether this is well received depends on when in the semester it is. Designing classroom AL often entails imposing a lot of AL out of class.
- AL can collect information for the teacher about the class and its knowledge / misconceptions – an educational gain in itself.

Part E:
Problems with the concept of "active" learning

Problems with the concept (not the term)

For researchers, teachers, and room-booking clerks alike, it would be helpful if "activities" were physical and observable.
But academic learning is almost all from mental actions'
and the type of action matters.

As students develop, they internalise actions which they used to need prompting about. What needed classroom AL yesterday is wasted time today.

part F: Chi's framework

Chi09a opening sentence of abstract:

"Active, constructive, and interactive are terms that are commonly used in the cognitive and learning sciences. They describe activities that can be undertaken by learners. However, the literature is actually not explicit about how these terms can be defined; whether they are distinct; and whether they refer to overt manifestations, learning processes, or learning outcomes."

Micki Chi's framework

From 1989 to 2008 Micki Chi worked in the USA on a variety of learning designs; mostly in maths and physics topics at the HE entry level. She generally used working only with a text book as her control/comparison group, and demonstrated the measurable advantages of various ALs.

In 2009a she realised they were not all equal, but could be ordered in terms of the size of benefit into three types: "Active-constructive-interactive".
This was re-labelled in Chi2014 as the ICAP framework.

Chi's framework (1) (2009)

<Worst>

- Active e.g. answering a closed question (e.g. an MCQ)
- Constructive e.g. generating reasons or "self-explanations"
- Interactive (with peers)

<Best>

N.B. The Sanders et al. review calls all three of these "active learning";
and calls Chi's "Active" – "Active-only"

Chi's ICAP framework (2) (2014)

In 2014 she felt the need to include a non-active state; and reversed the order to get an acronym "ICAP".

<Best>

- Interactive (with peers)
- Constructive e.g. generating reasons or "self-explanations"
- Active e.g. answering a closed question (e.g. an MCQ)
- Passive e.g. listening

<Worst>

Chi's framework (3)

Chi (2009) proposed a scale of increasing learning effectiveness:

a) Active e.g. answering a closed question (e.g. an MCQ)
b) Constructive e.g. generating reasons or "self-explanations"
c) Interactive (with peers).

These all involve mental (re)processing of the matter being learned: just as Laurillard's model does.

But Chi's three imply a prior category of not learning: inattentiveness.
And between that and Chi's 3 activities, there is also being active, but not in a way that affects learning e.g. mindless button pushing, filling in colouring books.

Giving a full spectrum of activities you see in a classroom:

a) Inattentive
b) Passive e.g. listening
c) Irrelevant physical interaction (so no useful mental processing)

d) Active e.g. answering a closed question (e.g. an MCQ)
e) Constructive e.g. generating reasons or "self-explanations"
f) Interactive (with peers).

Chi's framework elaborated (4)

<Best>

- Interactive (with peers)
- Constructive e.g. generating reasons or "self-explanations"
- Active e.g. answering a closed question (e.g. an MCQ)
- Irrelevant physical interaction
  e.g. highlighting text as you read (so no useful mental processing)
- Passive e.g. listening
- Inattentive

<Worst>

BTW ..... Postscript on Chi

Chi has also shown two other things that seem to me important.

In 2008 she showed that watching videos of a personal tutoring session can be as effective for the learners watching as being one of the tutees in the video IF they watch in pairs, and follow a worksheet.

In 2017 she showed that videos *OF* dialogue are more effective (for learning by viewers) than videos of monologues. (She showed that when they were watched by pairs of learners; but says it has also been reported by others that this is true when videos are watched individually.)

The magic of peer interaction is strong stuff in many different ways ....

Part G:
Which activities generate learning?

Physical? No

Receiving, recalling? very little

Processing, transforming, applying the knowledge? Yes

Mathemagenic power

All human actions cause both material and learning effects.
But conceptual learning come mainly from processing.

Sequence of effectiveness of learning / revision effects (low to high).

1. Re-reading; highlighting bits as you read. (Just recognition)
2. Test yourself: read a question, recall /calculate the answer (recall)
3. Transform into another representation
4. Apply the knowledge to new examples
5. Teach someone else the concept. ≈≈ write an essay for someone else.
6. Deliberate deep-learning expansion of connections.

Part H:
Types of ILOs for ALs

Social vs. private learning

All the above were really inidividual gains.

Although some of the best of them used social cues to prompt private thinking.

But there can be genuine social gains and effects: essentially building a (learning) community.

Peer comparison: an important type of information for student self-regulation of their work.

Fundamental to both classical and ultra-modern designs is periodic synchronisation of a class; there can be no discussion (no peer interaction) except where all learners have learned the same thing by the same date.

Different types of ILOs for ALs

- Individual learning gains.
- Social gains: forming a particular kind of social relationship (that fosters more learning).
- Gains by the teacher in understanding the class better: constructivism requires this for individual "misconceptions".
- Diversity: arranging for learners to experience benefits of mixed-type of classes.
- Individualised adaptation of a topic to individual learners' interests through self-selected division of a topic into parts.

Schools' "AL"

Elizabeth notes that part of advice to teachers on active learning is "Teachers spend significant amounts of time actively teaching. ... rather than relying on working only through textbooks."

My chief conclusions

- AL types are not the same or even similar in their effects.
- Write down your aims (ILOs) (privately) to help you decide what you want, and so what AL to select.
- Often designing an AL activity for doing in class is simultaneously designing out of class work (the prep.).
- Choosing synchronous vs. synchronous learning activities is probably the most fundamental design choice on all courses, because this is choosing self-paced vs. peer interaction.

A place to stop

For the slides, handout etc. see:

http://www.psy.gla.ac.uk/~steve/educ/AL.html