

## CERE slideset 4A:

Concepts and Empirical Results in Education

Extending principle A: Learner and "Teacher"

Peer int.; solo/social. Social / Constructivism

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<http://www.psy.gla.ac.uk/~steve/courses/cere.html>

L4 "CERE" 9 March 2016

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## Extensions to Laurillard's model principle A: the Learner and Teacher relationship Above all: Peer interaction

### Is learning solitary, or social?

(Link back to L-model)

(Link fwd to Peer-int)

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## Laurillard homework exercise from last time.?

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## The management layer

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## The "management layer"

The L-model describes the "object layer" of activities that promote learning of the knowledge itself.

Parallel to that is a layer about how those activities are decided on, organised, managed.

A little like: how many student questions are about "admin": when is the lecture, what should I do now, how many questions in the exam, ....)

But also like: how a student decides how many hours to study  
And how a student may organise a study group, choose topics for that week's group, .... Email a lecturer and ask for an extra session, ...

See my web document on the management layer (linked to from main CERE page).

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## The management and object layers mix

The previous table implies that management and object levels mix. I.e.:

One dimension is who helps your learning by providing information and control: peer or T or other person.

Another dimension is who organises your learning: you, peer, Teacher, .... This is the learning management layer.

Cf. contingent tutoring: where the tutor manages the learning by holding the whole activity and its purpose together, as much as by providing content (hints on what to do next)

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## The different kinds of way in which Other people may assist our learning

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## Laurillard doesn't grasp how important peer interaction can be for learning (nor did Vygotsky)

Peers are often important in several ways; but they only occasionally function like the Teacher in the L-model. One key thing is: peers are often NOT transmitting truth which the other learner converges on.

In L-model, learning and teaching is through the interaction of a learner and a teacher. But in fact there is a much bigger and more complex set of possible relationships of a learner with other people who influence and assist their learning.

Turn now to the big table in the handout and also look to the screen for the next slide which comments on it.

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Learners benefit from others with and without special expertise, intention, or being personally known  
+ indicates an activity initiated by the learner (proactive-ness)

Helper's expertise	Intention to teach	Personal relationship (contingent action)	Not personal
Unequal, staff, benefit not reciprocal	Intended	Teacher monitoring, Scaffolding of procedural skills + Ask a tutor	Lecturing, Writing a textbook, + Asking an expert
	Unintended	Role model (using a teacher as), (+) Imitating or observing someone more knowledgeable whom you know	+ Eavesdropping on strangers, Using a celebrity or hero as a role model, + Studying the career of a politician to gain similar success
Equal, peer, reciprocal benefit	Intended	+ Alternating roles e.g. testing each other, student reciprocal critiquing, The same but imposed by staff	Wikipedia, Anonymised versions of student reciprocal critiquing, + Posting a question to a forum
	Unintended	Peer discussion, + Borrowing lecture notes, + Spying on, imitating, or observing a classmate you know	Anonymous peer review, + Comparing your marks or actions to the class norm, + Listening to classmates' questions and comments, + Mutual help with the process e.g. ask where the classroom is.

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## The big space of possible relationships between the learner and "helpers"

The table tries to express that all combinations of the following four binary dimensions are common:

- Gradient of Expertise: the helper may or may not be an expert.
- Intention: They may or may not intend you to learn.
- Personal: They may or may not have a personal relationship with you (and so act contingently with you).
- Learner initiates activities, or not.

(These 4 can also be regarded as 4 dimensions of types of peer interaction.)

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## The heart of peer interaction

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## "Debate"

Who thinks groupwork is an important and beneficial learning activity?

Who feels they learn better alone, individually?

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### Miyake and “constructive interaction”

We can understand Hake's and Mazur's demonstrated practical educational successes in terms of the theory developed in developmental psychology of how peer interaction promotes individual' s conceptual advances.

Miyake (1986) got researchers round her lab to discuss their understanding of sewing machines.

Detailed analysis of the conversations showed that this was NOT teaching, yet both did advance their conceptions.

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### Christine Howe's work (1)

Long series of studies on peer interaction causing conceptual development.

Good selected paper:

Howe, C.J., Tolmie, A, and Rogers,C. (1992)

To get the effect, you need to work on the setup:

Peers with different prior beliefs

Elicit commitment to their personal view in advance e.g. write their view, then show peers this opinion.

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### Christine Howe's work (2)

- Benefit is delayed (e.g. 4 weeks)
  - Final conceptions are different in solo than group interviews
  - More advanced child ALSO advances still further  
I.e. it is NOT information transmission
  - “not agreement but private conflict resolution”
- ⇒ Mechanism is metacognition  
(Howe, McWilliam, Cross 2005)

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### Asking about confidence (Hunt, 1982)

Hunt (1982) (in an artificial experiment) showed that participants who first chose an answer and then had to indicate a confidence level learned about 20% faster than those who just chose an answer.

(This general issue is sometimes called “meta-knowledge”: when the learner isn't just a recorder of information but reflects on their learning and may modify their learning activity because of this.)

Gardner-Medwin's CBM (confidence based marking) is a direct application of this.

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### Sarah Honeychurch's best learning experience "Rhiz"

A couple of years ago, Sarah startled me by saying the MOOC she was doing on "Rhizomatic learning" was the best learning experience she had ever had. Since she has spent all her adult life in universities, this seemed important.

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### Rhiz (2)

Features I have picked up about this:

- It was the discussion, largely peer discussion, which was the heart of this. (Though seeding by the course leader may have been more important than she noticed at first.)
- Such discussions were not done on course-provided software (like Moodle) but moved naturally between platforms: Twitter, GoogleDocs, blog sites, ... Skype, ...
- This seems to reflect that, in learning-productive peer interaction, there are actually different phases each supported best by different platforms.

E.g. Blogs: one person offers a written monologue (Laurillard activity 2?), and attracts discussion around their view (L-act-3?)  
Twitter: arrange platform / time for a new phase of activity

....

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### Rhiz (3)

Community, or at least friendships, grew as a result; and affect new occasions / courses / ....

Even in the first run of that course (MOOC), learners divided into groups with different learning aims (agendas) e.g. Those who DID want to discuss the writing of Deleuze about "rhizomatic knowledge"; and those who did NOT, but were interested in ideas about learning and whether the new metaphor / notions were interesting and in what way.

Courses like this are not only full of peer discussion, but also (by intention since the course leader is deeply constructivist and student-centered) make the students feel they are choosing the learning aims and direction of the whole course as well as of each discussion. Jigsaw can feel like that too at its best.

### Rhiz (4)

Sarah and I are planning to offer you a taste of such online peer interaction in the week after the last course lecture.

We will agree with you, as far as possible, the day and time; and organise a one hour "Twitter chat", on ideas that you most want to clarify.

You organise yourself a Twitter account in advance (if you have one you may or may not choose to create another one for this purpose);

We announce a #tag and the topic

You probably want to prepare and send one tweet in advance

Then be somewhere connected to Twitter and join in for the hour; feeling free to leave (perhaps exhausted) after 60 mins.

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### "Catalytic" effects on learning by peers, teachers, ....

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### Questions:

Miyake, Howe, Hunt may be viewed as provoking questions in the learner, even though they do not stress it.

However one of the biggest published successes (introduced in CERE's session one) is that of "Interactive engagement" and "Peer instruction" which explicitly revolve around asking students questions. These may be presented using Electronic Voting Systems (EVS).

But what kind of questions?

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### Mazur's peer instruction

Mazur's peer instruction is a method of teaching that may (but need not) use EVS; Is grounded in a psychology of how peers aid learning Is addressed as a long researched principal weakness of his course's particular subject matter (mechanics)

It revolves around a particular type of question that Mazur calls "ConceptTests": basically brain teasers.

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### Brain teaser questions

The point is to provoke debate, internal and between peers. Cf. Socratic questioning, and "catalytic assessment"

Remember the old logo or advert for Levi's jeans that showed a pair of jeans being pulled apart by two teams of mules pulling in opposite directions. If one of the mule teams was sent away, and their leg of the jeans tied to a big tree instead, would the force (tension) in the jeans be:

- half
- the same
- or twice what it was with two mule teams?

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## Peer Instruction: Mazur Sequence

1. Concept question posed (brain teaser)
2. *Individual Thinking*: students given time to think individually (1-2 minutes)
3. Students provide individual responses
4. Students receive feedback – poll of responses presented as histogram display
5. *Peer Discussion*: students instructed to convince their neighbours that they have the right answer.
6. Retesting of same concept
7. Students provide individual responses (revised answer)
8. Students receive feedback – poll of responses presented as histogram display
9. Lecturer summarises and explains 'correct' response

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## Getting students to design the questions

This is another powerful teaching tactic ("learner authored questions"). Perhaps more suitable for levels 3,4?

Basic idea:

Students have to design a test MCQ (best in a small group) complete with reasons why each response option is right or wrong.

Have to aim for questions that discriminate (splits class).

Why is this effective? Same underlying reason as Mazur: the factual question requires them to generate reasons .... <sup>26</sup>

## Summary on "catalytic" effects

These are all demonstrations of how learning-productive it can be to get learners to notice they have a problem, but not give them the answer. Questions as catalysts to learning (not direct telling them what to think).

This is the essence of Constructivism.

But many of these also use the social stimulus of peer interaction. These are one kind of Social Constructivism.

But note that these are NOT mainly about one peer having the answer and telling the other; not about the social distribution of knowledge; not about co-construction of either a physical or a mental product.

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## Brain teasers as drives / seeds for organised peer discussion

I have run a number of maxi studies on peer discussion.

Timmons found that scores on a generic critical thinking test correlated with whom students were living: friends were best; family next; alone or with non-friends last. Opportunity may drive how much productive peer discussion happens "in the wild".

In studies on artificially crated peer discussion groups (e.g. on Facebook), the amount of useful discussion depended strongly at least for the opening weeks on whether the organiser suggested topics.

Again: good topics or questions have a strong effect on each given occasion; but perhaps not when there are ample opportunities.

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**Read, Discuss, Write:**  
the fundamental triad of learning activities?

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## Read, discuss, write (1) See one, do one, teach one

I will start with learning a skill (rather than conceptual content).

Here read, discuss, write might be mapped on to:

Watch,

Do under supervision (i.e. c-tut)

Instruct (articulate what is done as well as just acting)

The surgeons' slogan about their training is essential that:  
see one, do one, teach one.

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## Read, discuss, write (2)

See Francis Bacon (1625).

The suggestion here is that studying (HE type learning) requires all of the 3 classic activities, and you have a deficit if you skip any one.

Are modern universities, which require piles of reading and writing, skimping on discussion by students?

Peer interaction has many forms (e.g. dancing: which is certainly peer interaction).

Discussion is the one whose learning benefits are established. Human language has many functions e.g. maintaining friendships.

Discussion is only one.

Discussion has many sorts.

Which sort(s) are best for promoting learning?

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## Read, discuss, write (3)

Debate vs. "CI"

Winning / persuading vs. advancing one's own understanding.

Some sorts of dialogue have been shown to be associated with learning, others not.

Giving the answer to the learner is ineffective,

Giving an explanation (i.e. reasons) is more effective,

Getting the learner to give their own explanation is the most effective.

Chi & Bassok (1989)

Chi et al. (2001)

Webb (1988)

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## Read, discuss, write (4)

The core argument:

If discussion is added on as an extra activity, then the learning gains are well proven.

But the natural sceptical rebuttal is: time on task strongly predicts learning, so adding any time will have same effect: nothing particular about discussion.

Bacon's argument is that there IS something essential about discussion, which more reading and writing cannot achieve.

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## Read, discuss, write (5)

We don't actually know a lot about how much or when discussion helps. But at times it has been demonstrated to make a big difference to learning.

When it does help, it probably works in two ways.

- a) Increases certainty, reduces anxiety: if the other person agrees with you, you take this as confirmatory feedback.
- b) Acts as a prompt to reflection, so you identify, and eventually remedy, holes in your understanding. As such, this is acting to promote iteration and convergence (principle B underlying Laurillard); particularly of deep learning.

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## Dimensions for distinguishing types of peer interaction

This is a similar idea to the table about different types of L and T relationships;

but attempting something similar for peer interaction types.

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## Peer dims? (1)

What NOT to think:

A lot of the peer learning literature uses, as contrasts, the terms "cooperation" and "collaboration".

My own view is: there are important distinctions to be made.

These words don't have any intrinsic difference in meaning; and almost no authors define them, while meaning different things from each other.

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## Peer dims? (2)

Here are 4 distinctions / dimensions differentiating kinds of peer interaction:

- Joint vs. reciprocal **benefit**. Share the proceeds vs. exchange different kinds of benefit (as in any purchase or barter).
- Joint **product** vs. reciprocal learning **benefits**.
- The level of the common thing: aim, goal, actions.  
E.g. Judo dojos share actions; CR collaborations share aims.
- Community and identity. **Community of learners**, of practitioners, ....

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## More peer dims (3)

How to extend CCI (conceptually constructive interaction) [Miyake, Howe] from 2-person conversations, to multi-person ones; online.

MOOCs need this.  
"Rhizomatic" MOOC;  
Taster event.

But does group bonding, community come before or after working together? (Sharif)

Is identity created by being part of a group, or a precondition for it to work well?

Is learning as opposed to doing (joint product) best served by strong social bonds?

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## More peer dims (4)

Bale's categories: Perry-meta-information as a prominent part of group interactions, as the group discusses who knows best, who can be trusted about each thing.

Excluding people??

Not having the same "conversation style": a barrier to CCI?

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## Constr / SocConstr

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## Constructivism Social Constructivism.

The point is in part to brief you on common theoretical terms (however bad)

And to explain what theory teachers are trained in

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## Constructivism: 4 alternative mottos

A] You can't do someone else's learning for them.  
*That is why c-tut always adjusts to make the learner construct the last step.*

B] "Learning results from what the student does and thinks and only from what the student does and thinks. The teacher can advance learning only by influencing what the student does to learn." — attributed to Herb Simon

*This is why lecturing isn't important, but perhaps designing the learning activities is.*

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## Constructivism: 2 more mottos

C] Helping without answering the question  
(?what PAL facilitators are trained to do.)  
"Constructivist teaching": cf. *c-tut*

D] "If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly." – David Ausubel  
*Starting points define the journey just as much as the destination does. Prior conceptions strongly affect learning.*

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## Constructivism (2)

Humans can in fact learn isolated things (nonsense songs, ...): so constructivism isn't quite a universal truth.  
But it's extremely wasteful not to build technical learning on previously learned things. So most learning is "bricolage": a handyman's cobbling together of new stuff out of old bric à brac.

Sometimes prior conceptions are wrong: but you still need to track down all those connections, work on what they should be, to stop your spontaneous wrong ideas answering for you.

Either way, constructivism leads directly to the idea that good learning is making as many connections as possible with what you already know: which is my definition of deep learning.

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## Constructivism (3)

This is the single most used theoretical buzz word in education, but different people mean different overlapping things by it. So there's a spectrum from the weakest meaning that almost everyone subscribes to, to radical interpretations.

- Telling alone is inadequate: learners construct knowledge themselves
- Must attend to connecting new ideas to ones existing in the learner already:
  - To prior conceptions
  - To prior experiences (Laurillard public/private)
  - To future experiences (Laurillard public/private)
- Authenticity (connection to real world, to prior motivations)
- PBL (problem based learning)

Contrast to: constructiONism: learning by building stuff yourself?

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## Constructivism (4)

So constructivism is always a statement about the learner and the (hidden) mental actions in the learner.

But some would say it is also a statement about what teachers should or must do.

Above all, to button their lips, refrain from telling, just prompt and get the learner to produce / construct the idea. Probably the key thing is say something always one step short of the conclusion you want them to draw: make them work, but work successfully.

Contingent tutoring; prolepsis (it works in rhetoric too); Socratic dialogue.

One of the (many) facets of Chi 2008 is her evidence that whenever the tutor gave feedback (told the answer) learning went down; whenever he got the student to produce explanations themselves, it went up. <sup>46</sup>

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## Social Constructivism (5)

The newer buzzword now is "social constructivism".

Again, not enough agreement on its definition or even the issue.

Alternative (NOT identical) candidates for the issue:

- A. Social vs. individualistic aspects of the grounding of knowledge
- B. Social vs. individualistic aspects of the source the learner uses.
- C. Social vs. individualistic aspects of the learning process [RDW]

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## Social Constructivism (6)

- Piagetian vs. Vygotskian accounts of learning process (C)
- \*Sfard: Acquisition vs. participation metaphors for learning
- (Given that community is seen as an essential aspect): is it seen as consensual, conflictual, or absent except in acknowledging how much our learning "comes from" others. My table (next session) is about this latter.

Probably ALL of these matter, but are not the same as each other (despite a lot of the literature talking as if they were).

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**Individualistic** (solo, cognitive) vs. **Social**  
views on the sources of learning.

See them as rival claims about the bases of learning and knowledge.

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**Social and asocial views of learning (1)**

There is a lot written, much of it confused, about whether learning or knowledge is socially based, or individual. It shows up in catch phrases (seldom defined) such as "social constructivism". In fact both are true but about different cases, and knowing which applies often matters.

Some knowledge is socially grounded e.g. what one pound sterling is worth, what the name for "London" is in French. People can and do change such things, but no evidence from the material world makes a difference.

Some knowledge is materially grounded: e.g. how far the moon is from the earth and it doesn't matter how many people believe a given distance.

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**Social and asocial views of learning (2)**

However this distinction actually applies independently 3 times over:

1. The grounding of a bit of knowledge for a whole culture
2. The grounding of a bit of knowledge for an individual with partial knowledge [Putnam]
3. The source of a bit of knowledge for a new learner of it.

In large societies with organised education, the learner's first source is usually social in all cases; but for some knowledge it will shift to a material grounding as they master it.

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**Social and asocial views of learning (3)**

Probably human groups have always been characterised by a specialisation of mental labour; and this is enormously more pronounced today. So there is usually a social component (deferring to a greater expert) in almost all our knowledge even of materially-grounded knowledge (e.g. distance to the moon; gluten free food).

Another common mistake is to confuse "social" with "sociable". Just because we acquire knowledge from someone does not mean we like them, nor know them, nor were intentionally helped to learn by them. As the large table shows: there are many different relationships between teacher and learner; all social as opposed to mechanical; but only some involving a personal and reciprocal relationship.

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**A place to stop**

For the slides, handout etc. see:

<http://www.psy.gla.ac.uk/~steve/courses/cere.html>

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