**A partial transcript of a radio 4 programme by Melvyn Bragg.**
**Guest Michael Shayer spoke about CASE (~= 1998).**

Piaget
Descriptive Thinking (6 to 11)…
Classify, use graphs, order tables, use number to compare quantity, simple cause and effect with 1 variable (i.e. concrete operations).

Seeing cause and effect with only variables leads to concrete thinking.

Hypothetical Thinking (11+)
With three variables or aspects to consider we can no longer use descriptive model, so we build a mental model, test it against what's there and modify it – so called formal operations

Formal Operations.
In everyday life we just use concrete thinking, but from second year in secondary school **children need hypothetical thinking and formal operations to have a chance of getting A's and B's** in science & maths.

At Chelsea College in the middle 70's we were a bit doubtful about Piaget's ideas so we set about testing 14000 children aged 10 to 16.

By 11, half didn't have a set of descriptive models, let alone hypothetical models, and by **16 only 30% of the whole ability range had developed the formal operations** needed for formal instruction. This is needed from year 2 onwards to benefit from instruction.

**So you have a pre-set upper limit unless can change that proportion.**

Russian: Vadotski?

Jumps in Understanding
Some jumps in childrens' understanding came by their own effort from some problem, some conflict, in which they can work it out for themselves

**Four out of five of these little acts of development came from seeing a successful performance just beyond where they are now and they instantly make it their own and internalise it.** These are random acts happening all the time, which we wish to increase by a large factor.

In the thinking science experiments/lessons we broke the lesson down into 3 acts.

Act 1
The teacher presents a task and questions the children so that they can define the problem and come up with a few strategies, possibly giving them some extra text or language to help them

Act 2
The children go away and work on the problem in groups of 2 to 6, not on worksheets but to get ready for a group presentation. They know that in 10 to 15 minutes time they need to talk to the rest of the class and they have got to have something interesting to say.

Act 3
This is difficult for teacher to manage. The group goes to the blackboard or apparatus and has to explain everything of interest that's come up. Then each group presents to the whole class.

**What we are doing is creating a large pool of possible successful performances of a variety of kinds and each child takes from that what they need at that point.**

We are trying to double the number of pupils that can benefit from good instructional teaching.

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Find out more at http://www.case-network.org
Mathematical Models at http://www.easypeasy.co.uk

Summary…