Selective attention in the development of expertise: transformation and new realities.

Dominic McArdle
Department of Education, University of York

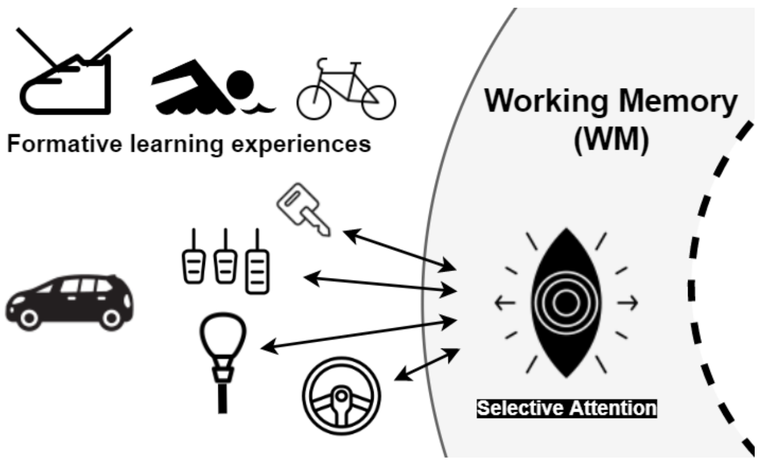
Introduction

In 2011 at a northern sixth form college I began an investigation into students' critical engagement in humanities A-level subjects, assessment of which rewards 60% of marks for critical analysis and evaluation.

As a result of this, in 2020 I began a research PhD with the University of York Department of Education into the cognitive architecture and processing taking place behind criticality.

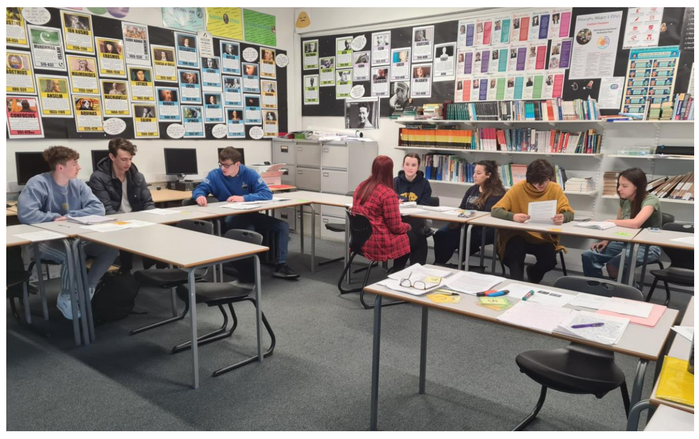
Early indications suggest that this cognitive processing takes place in the formative problem-solving activities of early childhood.

It is a matter of some concern however that this processing is not comprehensively assessed until Level 3, by which point almost half of the adult male population have left full-time education.



Research Methods

A quasi-experimental study into the impact of a metacognitive intervention into two humanities A-levels at a northern sixth form college.



This research builds on psychological insights into problem-solving that have been identified in the lab (Shipstead, Lindsey, Marshall, & Engle, 2014) and applied to the field of high-stakes problem-solving environments, e.g. medical students and airline pilots (Lee, Leppink & Hanham, 2018). Its novelty comes from exploring whether these findings are generalisable to wider educational settings.

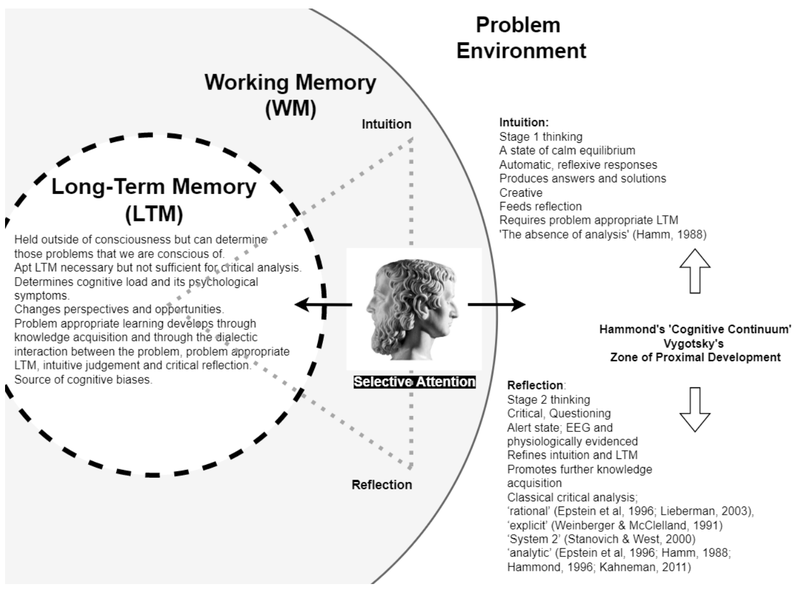
On the basis of this pilot study, the project will then examine the qualitative impact of this cognitive modelling on teachers' understanding of and ability to facilitate critical analysis and evaluation in the classroom.

The Project

The intervention is based upon the premise that in working memory (WM), selective attention engages in a dialectic interaction between the contents of long-term memory (LTM) and the features of the environment with which we critically interact.

Using the resources available to it in LTM, selective attention picks out specific features of the problem environment that are judged to be particularly relevant to the specific problem at hand (Shipstead, Lindsey, Marshall, & Engle, 2014).

Having isolated that which is of relevance, intuitive judgements can be formed about it, and these initial judgements form a basis for reflective analysis and further learning.



When there is a basis in LTM from which to form intuitive responses in WM, they are formed instinctively, immediately, automatically and with ease (Kahneman, 2011; Lee, Leppink & Hanham, 2018).

Intuitive responses can be based on sufficiently appropriate or insufficient LTM. Sufficiency is determined by the level of previous engagement with the problem and the degree of reflection on the adequacy of prior responses.

Intrinsic cognitive load (how intrinsically difficult a problem is) occurs where the intrinsic complexity of the problem outweighs the sufficiency of appropriate experience available in LTM (Debue & van der Leemput, 2014).

In this intervention, selective attention is thereby given a prominent role in developing students' metacognitive understanding of critical analysis and evaluation and the development of their own subject expertise, a model that is subsequently used to structure their learning experiences, preparation for and responses to assessments.

The intervention has led to the development of some novel teaching resources and activities, but mostly it has only required recontextualising existing classroom practices.

Conclusions

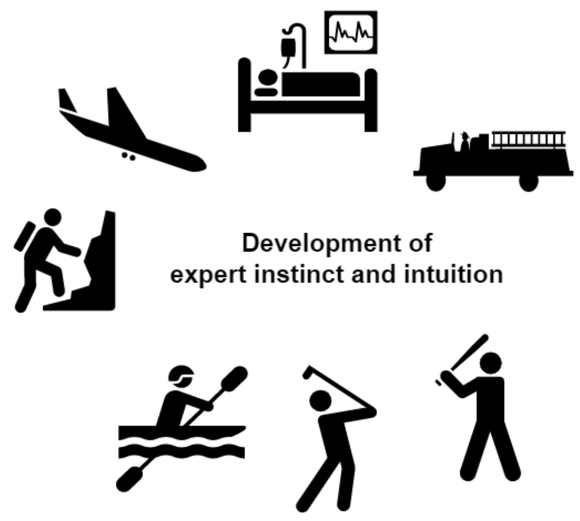
It is very early in the research to draw conclusions, but some initial findings suggest that:

Teaching resources and activities that scaffold the processing taking place within LTM and WM are transferable between disciplines.

Problem solving in diverse subjects may require the use of different heuristic techniques, but they all draw on the same cognitive architecture.

Awareness of distinct cognitive processing behind criticality can lead to immediate behavioral change and more focused critical engagement in some students.

Received wisdom concerning knowledge acquisition may have created a culture of student expectations that stymies their critical engagement with subject problems and hinders the development of subject expertise.



Levelling up:

Recognising the cognitive engagement involved in the development of subject expertise may require re-evaluating educational priorities, placing greater emphasis on interest and motivation, acknowledging the utility of acquired subject knowledge rather than overemphasizing its primacy.

If it is the case that the cognitive architecture behind problem-solving, critical analysis and evaluation is utilized in early years formative learning, the justification for not comprehensively assessing it until Level 3 is brought into question.

Doing so may unlock potential that may have been previously lost in an educational system that continues to see learners as vessels to be molded and filled rather than as active stakeholders in their own development.

It is intended that these initial forays into critical cognitive processing will lead to experimental studies into changes in problem-solving cognition and behaviour using, among other techniques, the 'Think aloud' method utilised by Newell and Simon (1972) in their analysis of problem-solving heuristics.

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