On Educational Neuroscience. An Interview with Paul Howard-Jones
Attorno alle neuroscienze applicate alla pedagogia. Un'intervista con Paul Howard-Jones

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ABSTRACT
Paul Howard-Jones is an expert in Educational Neuroscience, who lectures at the Graduate School of Education, University of Bristol. In the following interview given in May 2013, he shares his thoughts on a number of topics he has researched over many years. First off, he insists on defining the limitations of the neurosciences in their dialogue with the realm of education (a famous example is his pars destruens on "neuro-myths" in his essay Introducing Neuroeducational Research: Neuroscience, Education and the Brain from Contexts to Practice, published by Routledge in 2010). He then addresses more recent areas of research: evaluating the impact of teaching strategies involving movement, games and creativity.
At the end of the interview, Howard-Jones states: "At the end of the day, neuroscience can only tell us what we can do, not what we should do. These decisions about balancing learners' experience and the curriculum need to be made by educators, although hopefully educators informed by neuroscience".
Howard-Jones argues that the concept of Neuroeducation should be conceived as a two-way dialogue between the laboratory and the classroom, without either realm eclipsing the other. Thus, though the neurosciences are known for their efficacy as a demonstrative platform, the educational sciences, too, must be recognized for their mastery of designing learning experiences.

Paul Howard-Jones è un esperto di neuroscienze applicate alla pedagogia; insegna presso la Graduate School of Education, dell'Università di Bristol. Nell'intervista che segue, rilasciata nel mese di maggio del 2013, condivide con il lettore alcune riflessioni attorno a temi sui quali da tempo la sua ricerca è impostata. In primis insiste nel definire i limiti e il perimetro nelle neuroscienze, nel loro dialogo con il mondo dell'educazione (celebre è la sua pars destruens dei "neuro-miti", operata nel saggio Introducing Neuroeducational Research, pubblicato da Routledge nel 2010). In seconda battuta interviene sugli ambiti di più recente indagine: la valutazione dell'impatto di strategie didattiche che comportano movimento, gioco, creatività.
A suggello dell'intervista, e a ridimensionamento del ruolo di supremazia assegnato da molti alle neuroscienze al confronto con le scienze dell'educazione, valga questo suo appunto: "Alla fin fine, le neuroscienze ci pos-

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sono solo dire cosa facciamo, non cosa dovremmo fare. Decisioni di questo tipo, riguardo all'equilibrio da raggiungere tra le esperienze degli alunni e il curricolo, devono essere fatte dagli educatori –idealmente, educatori che abbiano nozioni di neuroscienze".
In sostanza al concetto di Neuroeducation va corrisposto, secondo Howard-Jones, il riconoscimento di un mutuo dialogo tra il laboratorio e l'aula, senza che un ambito si debba appiattire alle istanze del secondo. Così, se le neuroscienze si muovono agevolmente sul campo della dimostrazione, alle scienze dell'educazione va riconosciuto ampio dominio sul terreno della progettualità.

KEYWORDS
Neuroscience; Neuro-myths; Movement; Embodied Cognition; Creativity
Neuroscienze; neuro-miti; movimento; filosofia del corpo; creatività

Introduzione

The 90s and early 2000s were characterised by a *transmissive* model of the relationship between neuroscience and education. The latter received information from the former, based upon which, in turn, the educational institutions designated advisable teaching practices.

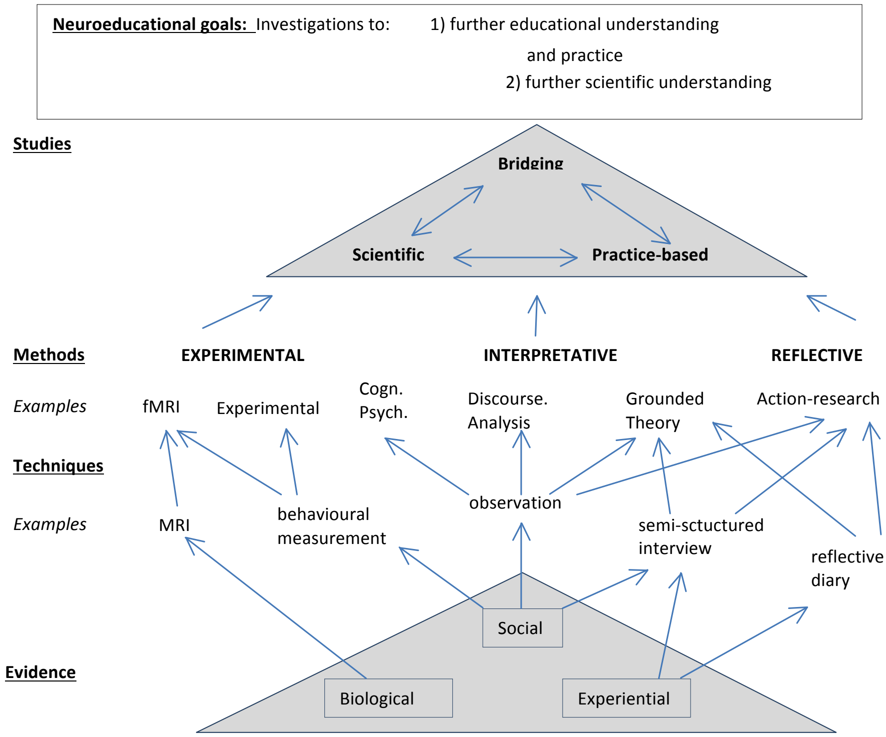
This was thus an unbalanced relationship which often gave rise to knee-jerk trends, oversimplification and misrepresentation.

Paul Howard-Jones' work seeks to fill this 'communication gap,' offering a new epistemological model and research methodology.

He describes an interdisciplinary science drawing from both neuroscience and education: one which employs both quantitative and qualitative approaches to data gathering.

More specifically, from a neuroeducational perspective, neuroscience serves to integrate data concerning biological aspects (therefore generally quantitative) into observations on social behaviours and metacognitive analyses carried out by students (more qualitative research tools).

The figure below represents the highly complex structure upon which Howard-Jones' vision of neuroeducational research (Howard-Jones 2010, 120) is founded.



The model proposed by Howard-Jones reflects his own career progression pathway: he moved into neuroscience after a lengthy career teaching computer science at a public school as well as roles as teacher-trainer and school inspector.

We recommend readers wishing to learn more about him visit <neuroeducational.net>, a site showcasing the research and resources of the *Centre for Mind and Brain in Educational and Social Contexts* at Bristol University, where Howard-Jones himself acts as coordinator. The site offers many free publication downloads, including: Howard-Jones, P. (2007) (ed.) *Neuroscience and Education: Issues and Opportunities, London*, Economic & Social Research Council; Howard-Jones, P. (2008) (ed.) *Fostering Creative Thinking: Co-constructed Insight from Neuroscience and Education*, The Higher Education Academy.

1. The neuro-myths

Prof. Howard-Jones, you have coined the term *neuro-myths* for certain poorly founded assumptions, which, nonetheless, have had a major impact on education, especially among language teachers.

1.1. The neat separation between the two cerebral hemispheres

T. - *The first neuro-myth we might tackle is the idea of a neat separation between the two cerebral hemispheres, which many educators have espoused. A number of assumptions have derived from this conception:*

- *Students can be classified as analytic or holistic, based on whether they are more left- or right-sided, neurologically speaking. In other words, more creative people are supposed to have a more "developed" right hemisphere, while more analytical individuals are thought to be more "developed" on the left side.*
- *A sort of "alternating model" for data processing (such as that developed in the 90s by Canadian neuro-educator Marcel Danesi: the "modal directionality principle" or "modal flow principle"), according to which right-hemisphere globally-oriented processes come before left-hemisphere analytically-oriented processes. In other words, some people believe that there is a sort of progression from the right to the left hemisphere during the processing of information. This entails a movement from the perception of the whole (i.e. in language learning, the meaning of a text) to the parts (i.e. in language learning, linguistic features, such as morphosyntactical, phonological, lexical etc.) and thus any attempt to present the part(s) before the whole (for example a given linguistic pattern before the text in which it is embedded) is labelled as counter-productive and "unnatural" in terms of the teaching process. However, this model (right left) fails to explain certain behaviours: indeed, certain individuals may find their attention instantly drawn to discrete components of a text rather than its global meaning.*
- *Brain-gym tasks designed to improve mental flexibility (for example, using your non-dominant hand for certain tasks).*
- *In sum, what is your opinion on the idea of a neat separation between the left and right hemispheres and the educational conclusions derived from this, such as the ones just mentioned?*

H.J. - I think some of this confusion arises from the fact that – yes – it is true that some types of thinking processes activate brain regions that are more one side of the brain or the other. The most famous of these is language, which tends to be more left-lateralised - although, if you're left-handed, there's about a one-in-three chance that it's more on the right side. However, performance in most everyday tasks, including learning, requires many regions in both hemispheres to work together - in a sophisticated parallel fashion. This working together is helped by something called the corpus callosum – an information "super-highway" that connects both sides. That's even true for language – there are important language regions on the right-hand side, e.g. for making unusual links between words. In reality, brain activity at any moment is occurring, to greater or lesser extent, throughout the brain. If we had the technology to show brain activity as it occurs, it would show shimmering changes of activity all over the brain, fluctuating on time scales of milliseconds. The idea we use the left side of our brain in one task and the other side of our brain in another is very far from the mark. The division of people into left-brained and right-brained takes this misunderstanding one stage further – and it doesn't appear to serve any educational purpose. Actually, there has never been convincing evidence that there's any educational value in categorizing people into one sort of learning style or another.

1.2. The Multiple Intelligence Theory

T. - *The Multiple Intelligence Theory has had a major impact on education and a great many "invididualized" practices have derived from it. The neurological data upon which Prof. Gardner bases his theory seems to be fairly robust. Briefly* *put, he relates certain skills to specific neurological areas (some are said to be somewhat diffuse, such as mathematical intelligence, while others are better defined), but at the same time he suggests a kind of concurrence of the different types of intelligence in solving real-life problems. By consequence, he suggests that educators should address all student profiles (the mathematically gifted, the linguistically gifted, the spatially gifted, the coordinationally gifted, and so on), through tasks involving the broadest possible variety of symbolic systems (not only language and logical reasoning).*

The Multiple Intelligence Theory therefore appears to be robust in its claims and to generate useful procedures. Nevertheless, you are sceptical about the theory and define it as a neuro-myth.

Could you explain why, and also give your opinion on the practices inspired by the Multiple Intelligence Theory?

H.J. - Gardner's MI theory proposes that it is more useful to describe an individual as possessing a small number of relatively independent intelligences, rather than possessing a single all-purpose intelligence. I know MI theory resonates with many educators, who see it as a good alternative to the idea of one general intelligence in education. Gardner has claimed "accumulating neurological evidence is amazingly supportive of the general thrust of MI theory". But the general processing complexity of the brain makes it unlikely that a theory resembling MI theory will ever emerge from it. Cognitive neuroscience is exploring the brain in terms of processes (vision, hearing, smell, etc) but not in terms of *seeing intelligence*, *auditory intelligence* or *smelling intelligence*. Within the field of neuroscience, it neither appears accurate or useful to reduce the vast range of complex individual differences at neural and cognitive levels to any limited number of capabilities.

However Gardner intended it to be used, MI theory is often applied in a "learning styles" way. That is, teachers try to teach to the strengths of each student in terms of their individual intelligences. But, as I have suggested already, it is very difficult to find evidence that such an approach to categorising learners in terms of their self-report can be effective in educational terms.

1.3. The link between neuroscience and Neurolinguistic Programming

T. - *What's your opinion of certain assumptions based on Neurolinguistic Programming (very popular among educators), according to which we can infer a "truth mode" or "learning style mode" by looking at our interlocutor's eye movements? Are they scientifically grounded?*

H.J. - It is difficult to criticise the neuroscience in NLP because, despite the title, it doesn't really appear to be based on any substantial science about the brain. I think perhaps they should drop the "neuro" in the title!

T. - *Suggestopedia is a language learning method which emphasises the remarkable potential of the human brain, something which is often underestimated. In particular, Lozanov stresses that teachers must find ways to address students' unconscious modes of learning. For example, he suggests filling the walls with posters not necessarily related to the content of the lesson (in his view, students can absorb language simply by looking around them), playing classical music while the class is listening to content; making students feel as comfortable as* *possible, and so on. What's your opinion on this idea of unconscious learning and ways to promote it?*

I'm not aware of Lozanov's methods, but it is true that we can unconsciously learn. It is also true that stimulus in our environment that is not related to the task in hand can be used to improve creative output. I'm all in favour of experimenting. If something appears to work then let's research it scientifically and find out how it works – and then maybe we can make it work better!

2. Neuroscience and teaching

T. - *After reading your book,* (Howard-Jones 2010) *an educator might feel somewhat disillusioned since, at the end of the day, there is little evidence from the realm of neuroscience to suggest which teaching activities can best facilitate learning. However, you do state that movement is a high-impact factor. Could you explain why this is, and which kinds of movement may be most productive?*

H.J. - Well I hope not too disillusioned! There are a lot of myths out there – and today we're talking chiefly about these – but the sciences of mind and brain are revealing a lot of really useful ideas for improving education as well. Yes, movement and exercise is certainly one important area. A recent review of 50 studies concluded that adding physical activity to the school day can enhance academic performance. There are now also many studies linking exercise to improvements in neural and cognitive function amongst children. Neuroscience is also providing insight into embodied cognition, which emphasises how actions influence our learning. This includes the enactment effect, for example when we have better memory of action verbs after performing rather than simply reading them. The close relationship between fingers and mathematics is another example of embodied cognition and this has been extended in the use dance-mats for children exploring number lines with their whole body. Brain imaging studies have also shown that when we observe others carrying out actions, mirror neurons fire as if we are carrying out the actions ourselves. This helps explain why teachers' gestures can enhance memory. For example, when a teacher imitated their students' behaviour during interactions, students improved achievement in a subsequent quiz. They also reported higher perceptions of rapport, and more confidence and satisfaction about learning outcomes.

3. Neuroscience and Creativity

T. - *Are there findings supporting the importance of stress-release strategies (such us humor) or divergent thinking strategies (and creativity in general), aimed at improving mental flexibility (can we infer the existence of a "creative intelligence"?), or personalization, ie. creating a link between content and student's personal life (i.e. personal meaningfulness), or group bonding, where people feel connected one to another, or critical thinking, through which students look for flaws in dubious reasoning?*

H.J. - Findings from neuroscience support a model of creativity based on moving between a generative process producing novel ideas and a critical evaluative process for assessing their value. While evaluation is considered to require narrowly-focused critical attention, the generation of ideas appears to benefit from a broader focus of attention. One brain imaging study has shown how individual differences can be explained in terms of an individual's resting state of attention (i.e. whether they are more broadly or narrowly focused). Another suggests that sharing ideas with others can boost our creative output by reducing our need to suppress our own automatic associations. In our own work, we showed how incorporating unrelated stimulus into a product boosts creativity by automatically increasing neural function in regions related to creative effort and the making of meaningful connections.

T. - *From a neurological point of view, what is your opinion regarding the harmonious balance many teachers are pursuing between repetition and improvisation?*

H.J. - We know rehearsal is very important for consolidating information in memory. When you learn something new, you need more working memory when learning it. After that it becomes more automatic, freeing up working memory. This is important, because your working memory is limited. So repetition (practice) helps you learn but also prepares you learn more. But creativity and improvisation are also very important. At the end of the day, neuroscience can only tell us what we can do, not what we should do. These decisions about balancing learners' experience and the curriculum need to be made by educators, although hopefully educators informed by neuroscience.

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