7 Concepts of mind: A developmental picture

Introduction

The surveys, student comments and observations undertaken during the course of the research suggested that patterns of cognition and learning were emerging that differed from conventional models of cognitive development and learning theory. A plausible hypothesis was that prolonged exposure to computers and the language associated with them would contribute to the metaphor of information-processing being applied to the ways in which students perceived Mind and associated processes.

One way of assessing whether these changes had manifested themselves within the student population was to test their concepts of Mind. If the 'computer as brain' analogy had been accepted by a number of students one would expect to see this reflected in the ways in which they defined the Mind. It could be expected that this would also be reflected in the ways in which students worked. In the next phase of the research, therefore, students were asked to define the human Mind, and how it worked.

Theoretical background

Much of the educational process is predicated on the assumption that learning and competence is developmental: the building blocks of knowledge require sound foundations if the ultimate structure is to be solid. In *The Philosophy of Childhood* Matthew (1994) examined the philosophical discourse of children, elicited through the use of Socratic questioning. His findings suggested that the philosophy of childhood should be treated as an area separate from that of mainstream philosophy, rather than as an emergent pre-adult philosophy. If this childhood phase is separate from what we conventionally expect to be philosophy then we cannot describe it as the first stage in a developmental

process.   The developmental stages identified by Piaget (1952; 1959), Kohlberg (1969) and others would apparently not apply to one aspect of thought.

Matthew examined the First Causes of conceptual development, to determine when concepts emerged and when they changed.   His thesis was that if children could no longer be seen as miniature adults, they may considered pre-rational or pre-scientific beings.   If that was the case, then it might be considered that they could not be thought of in the same terms as those who were adult, rational and scientific.   Implicit in this is, of course, the model of 'human' as adult, rational and scientific.   This serves as the model for much of the teaching and learning process in schools, in which children are led through sequences (related to their developmental phase) to the rational and scientific state that is adulthood.

Evidence of Modality Judgements demonstrated by children when watching television would suggest that the concept of personality and existence is something which children do possess.   When children see themselves or others recorded on video they engage with the concept of what constitutes 'live'.   Work by Jaglom and Gardner (1981) suggests that there are three levels of modality judgement through which children pass up to the age of 5.   They use the structuralist terms paratactic and hypotactic to describe the processes undertaken by children.   Paratactic means that within a structure, options exist alongside each other - for example, within a compound sentence, where elements are linked by the conjunction 'and'.   A hypotactic structure, on the other hand, is one with subordinate elements - for example, a compound sentence with embedded clauses.

Modality judgement	Process	Age
Non-differentiation.		⇨2 years.
Sharp differentiation.	Binary paratactic structures.	
re-integration.	Complex hypotactic structures.	⇨5 years.

This raises the question as to whether children are working towards higher stages of developmental concepts, grappling with category and conceptual errors until they are resolved.   Or are they rather, as Matthew suggests, exploring different and, to them, equally satisfying theories from which they move on or move away?

What does appear to happen is that children constantly reconstruct their concepts.   This builds their understanding of the world.   As concepts are constantly reconstructed the cognitive process changes and develops. Cognitive development is therefore endogenous.   With this cognitive growth comes a theoretical shift in the way in which objects (and the relationships between them) are conceptualised.   This has an impact on the use of language (cf. Winograd and Flores) and the use of language (which can be regarded as one of Vygotsky's 'intellectual tools') in turn has an impact on the cognitive process.   When young people are exposed to theoretical terms and expressions ('cognates') this triggers a conceptual search for meaning.

Gopnik and Melzoff, 1997, view this process as analagous to that followed by scientists, where existing theory is reviewed in the light of experience. This theory and its postulates have implications which are themselves tested against experience.   In the light of these there is a reorganization of ideas, which then results in a new theory.

Gopnik and Melzoff argue that each child at birth is equipped with a set of dedicated interpretative devices, or modules.   These enable children to construct and develop a variety of mini-theories of the world around them, in terms of animate and inanimate, real and non-real, cause and effect, and so on. This is the process that they see as similar to that undertaken by scientists. The concept of the Language Acquisition Device (Chomsky, 1968) would be a precondition for the interpretative devices posited by Gopnik and Melzoff.

Emerging theories of Mind

The assumption underlying this phase of the research was that responses cited by students in their definitions of Mind would be informed by a range of influences.   Many of these would be drawn from popular science and the media.   Three separate strands emerge from these influences, which could be termed Constructivist, Materialist and Computational.

The Constructivist strand would hold that the Mind is a product of our biology, combined with the five senses, basic drives and the capacity to learn. It has evolved culturally, with built-in replication from generation to generation, and is shaped by arbitrary societal variances.   Our behaviour is predicated by both biology and culture, whereas our constraints are imposed by biology.

The Materialist model of Mind would suggest that the Mind is produced by the brain, through the psycho-chemical properties of brain and tissue.   What we sometimes call 'Mind' is therefore nothing more than a consequence of the brain's anatomy and physiology.

The interpretation of Mind that could be termed Computational is based on information theory – encoding and decoding – so our beliefs, desires and information are encoded as symbols.   The congruence between symbols generates new symbols (our beliefs, desires and information) and some of these symbols will generate a physical reaction, which we term behaviour.

Congruent symbols group together in modules: these mental modules can act together (a process often referred to as 'chunking' (McShane, 1991, pp.342-343), producing an infinite number of different representations.   The different levels of generality of these representations are the cognitive process.   These 'mental tools' can be content-free, which offers the power to think and behave in new ways.

Differences in thinking will lead to differences in encoding (symbol generation), which in turn will produce differences in congruence.   When this occurs the result will be new symbols (beliefs).   These new beliefs will lead to differences in behaviour.

The Computational theory of Mind informed the perspective of Winograd and Flores.   It formed part of the grounding for this investigation.

Investigating concepts of Mind

During 1996-97 two investigations were undertaken to determine which concepts of Mind were held by young people, and how they were formed.   The first was carried out by A/S Psychology students at Boston Spa Comprehensive School as part of their coursework and an introduction to data collection techniques.   The group decided on the single question What is the Mind? and asked a random sample of twelve students in each year group.   (Total: 72 students.   School roll: 1787 students.)

Results were collated and a range of responses was identified.

Table 7.1: Investigating concepts of Mind

Response	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12/13
Don't know	6	4	3			
The brain/grey matter	1	1	2	3	6	3
For thinking	2	5	3	1		2
For storage	1					1
Intelligence	1					
For control	1			1	3	
Personality			2	6		2
Consciousness			2	1		4
A computer					1	
A major organ					1	

By Year 10 all of the students interviewed were able to attempt a definition of the Mind.   What this initial survey failed to reveal was whether students in Years 7 - 9 who were unable to provide a definition of the Mind lacked the concept of Mind, or lacked the language through which they could express otherwise inchoate concepts.   One reason may be more fundamental, in that, whilst many students have an implicit understanding of how and why they do things, they are unable to explain why (Cf. Piaget; Vygotsky).   Donaldson (1987) and Gardner (1983) argue that the form of the question posed by the researcher predicates the response, rather than the level of understanding in the learner.

It was significant that only after Year 10 did students identify the Mind with personality or consciousness, whereas the Year 11 students interviewed primarily saw the Mind as being connected with the Brain, with thinking and with control.   For almost 20% of students in the sample the Mind was synonymous with the Brain.

Metaphors of the Mind

It was anticipated that the students would construct their explanations of the Mind from the language and concepts that they used for other things - most

specifically, from the language and concepts of the computers which they use every day.   What was significant, however, is that only one student from the sample (in Year 11) compared the Mind to a computer.   Whilst the computer may be an information processing device, and the Mind process information, students did not see the two as synonymous.   Another student (in the same year) described the Mind as "…a major organ…".   Students in the initial sample, then, did not consider the Mind and the computer as synonymous.

Nearly 30% of students, however, considered the Mind in functional terms: for thinking, for storage, for intelligence or for control - the information processing model.   There is a correlation here with responses from students in an earlier survey, (Uses and Gratifications Survey, Spring 1995) when they were asked why they used computers.   The responses grouped as Personal Identity included the set Reality Exploration, in which students cited gaining mastery of computer routines as an important reason for their use of computers. This transactional understanding of the ways in which computers are used may well have provided the students with a model for understanding the Mind.

Testing the hypotheses

During the summer term of 1997 a new survey was constructed which extended to the whole school, to identify models of Mind held by students, determine a developmental progression and test the validity of the Computational model as an explanation for the questions "What is the Mind? How does it work?".   All responses were recorded, analyzed and grouped by age and gender.   (Years 11 and 13 did not form part of this survey: they were on study leave.)

Students produced a number of definitions and examples within their responses.   These have been recorded within each of the relevant categories.

Table 7.2: What is the Mind?

Year group ⇒	Y7		Y8		Y9		Y10		Y12	
Gender:	F	M	F	M	F	M	F	M	F	M
F= 533; M= 521	128	103	112	107	134	113	115	114	36	72
Category ⇓	%	%	%	%	%	%	%	%	%	%
Control	67	59	49	46	51	46	50	31	47	19
Brain	51	50	35	27	31	34	38	33	53	11
Thinking	34	28	51	40	51	42	26	23	47	17
Storage	25	28	28	42	32	26	19	19	25	8
Emotion	24	11	38	24	36	35	30	20	56	15
Ethics	11	9	10	2	7	7	10	4	17	7
Identity	10	12	27	15	20	4	22	21	44	14
Computer	8	16	4	10	9	13	3	4		7
A major organ	6	3	4	6	7	5	3	3	6	1
Mechanical	6	4			4	6				1
Intellect	5	1	2		1.5	2	3	1		
Consciousness	5	5		2	4	1	5	9	11	11
Communication	4	1			2	7	2	1	3	3
Visualisation					1	2		1		
An Inner Voice			1	3	2	1			6	
The Soul			3	3	4	4			3	4
God/Supernatural			2	2				2		
A Myth, Dream, Abstraction					1			1		
A Way of Thinking									8	1
Achievement							1			
Power			1				1	1		
Don't know			1	1			8	11		1

Student responses

Student responses to the questions tended to be thoughtful and considered. This is particularly true for the younger students, many of whom found it difficult to articulate their ideas.   Nevertheless, they tried to communicate their

understanding, whilst recognising that their ideas could not yet be considered fully formed. Many resorted to diagrams and illustrations in their explanations.

The number of students in Year 10 (8% female; 11% male) who responded with a 'Don't know' may be indicative of a developmental shift that is observed between Year 9 and Year 10.

One Year 7 student wrote the following account of his understanding of the Mind. It extends over three paragraphs. The only editing is where my comments are interspersed.

> The human Mind is, to put it bluntly, just a collection of millions of cells, making a kind of pinky-grey blob inside our heads. However, it is also the amazing thing that helps (and makes) us think and live our lives differently from all the other animals on earth. Every human being is unique - no two are exactly the same. We have evolved further than anyone could imagine, from monkey-like beings in the beginning to the most clever race on earth, with huge cities and modern technology. Although we are all unique, we are not, however, all equal. Many people on our earth live in poverty, whilst others recline in the lap of luxury.

The initial paragraph establishes a socio-biological foundation for what follows. The Mind is reduced to the interactions of a collection of cells ('millions') located in the brain ('a kind of pinky-grey blob'). It produces individual thought that leads to difference and development, whilst at the same time producing inequality and justice.

> The human Mind is an incredible, almost incomprehensibly complicated thing. It controls every movement and thought of a human, from breathing to driving a car. It can remember things that happened way back in the past, and take in new information and learn new skills every day.

At this point other aspects of the Mind are identified: control, memory and information processing. This latter aspect is developed in the final paragraph.

> Basically, it works by a complex system of nerves and cells to send messages around the body, telling us what to do. The cells in the brain control movement, memory and all other functions of our bodies. The body is able to sense things with the nerves, such as heat and cold, and these can send pictures to the brain

> which tells us what we are seeing. Human beings can also hear sounds, smell and feel.
>
> (Boy, Year 7.)

The information processing metaphor becomes fully developed at this point – "…sends messages around the body, telling us what to do." In the final phase, though, it is the brain which "tells us what we are seeing."

The student here attempts to construct an explanation of Mind that combines the three popular explanations: the Constructivist: "…live our lives differently…we have evolved further than anyone could imagine…we are all unique"; through the Materialist: " just a collection of millions of cells a complex system of nerves and cells…" to the Computational explanation: " it controls every movement and thought…remember things…take in new information…learn new skills…" It is the explanation of a twelve-year-old who knows that the understanding of Mind depends upon the perspective one adopts. The process of definition itself constructs the Mind.

A simple explanation of Mind, in that it is immaterial and both the cause and product of consciousness, combines elements of both the constructivist and materialist approaches.

> If you cut open our heads you wouldn't be able to find our Mind. It is not an organ.
>
> (Girl, Year 8.)

> Everyone has a Mind. It starts as a baby when you are born and goes when you die.
>
> (Girl, Year 8.)

> There isn't an organ in your body called The Mind, it's just inside.
>
> (Girl, Year 8.)

Some explanations are reminiscent of Berkeley's Idealism or phenomenalism.

> The Mind is in our heads, and without it nothing would exist.
>
> (Girl, Year 9.)

> The human Mind is a concept called consciousness.
>
> (Girl, Year 9.)

Other explanations acknowledge the inherent tension between materialist and constructivist definitions, whilst adding the possibility of an existentialist dimension.

> The human Mind is probably one of the most complicated, if not the most complicated 'thing' on earth. Some people may say the Mind is the brain, but the brain is different to the Mind. It doesn't work like a computer or robot, where you switch it on or off, it's just there, inside you, all the time, and nobody can change it or take it away. People say "I've changed my Mind" not my brain. This is because they have changed their opinion and feelings on a certain subject: this is their Mind.
>
> (Boy, Year 9.)

Here the student starts from a position of Mind-body dualism, acknowledging that the materialist position based on computing cannot provide an adequate explanation. For him, the Mind is constructed from thoughts, opinions and feelings. Another student, also in Year 9, is less able to articulate her explanation. She is aware that an understanding of Mind is essentially developmental. For her, however, Mind and identity are one and the same.

> When I was younger, I would have said that the Mind is like a box, which opens and closes according to the situation. It lets out different emotions, words, thoughts etc. But now I cannot even think about what the Mind is, without getting myself confused. The Mind makes us what we are. Without your Mind, you have no outside, because there is nothing on the inside.
>
> (Girl, Year 9.)

The following comments illustrate the beginnings of existential awareness; "the ghost in the machine", to paraphrase Koestler.

The human Mind is two things. It is a complex organ made up of millions of little cells. In other words, it is a part of your brain. The other thing, it is something that is there but not there.

(Girl, Year 10.)

> The human Mind is not matter, it is abstract concept which binds our interior thoughts and impulses to our exterior actions. It is not there yet it is a window to our soul which lets our emotions have a playground of instincts. It is the nucleus of our existential body of Mind and matter.
>
> (Boy, Year 10.)

Other explanations cast the Mind as 'the midwife of change':

> It's like a time bomb, waiting to go off.
>
> (Boy, Year 10.)

> The human Mind is the driving force for mankind's thinking, as individuals and as a collective.   It works on instinct and experience.
>
> (Boy, Year 10.)

The predominant explanations given by students fall into two categories: the first is that of consciousness, both as its cause and its product.   The second is that of the activity of the brain: the interaction of cells and body chemistry.

> It holds memory, and builds personality through experience and learning.
>
> (Boy, Year 10.)

> The human Mind is a series of impulses generated by the central nervous system of the brain.
>
> (Boy, Year 10.)

> The human Mind is grey and squashy.   It is full of cells and electricity.
>
> (Girl, Year 10.)

> The human Mind is what gives us consciousness.   It enables us to feel and make decisions, to invent and to create.
>
> (Girl, Year 10.)

> Mind is something you can't touch – it has no matter – it is just there and you have to trust and believe it, because there is no proof.
>
> (Girl, Year 12.)

> In a way the Mind is a learning experience.
>
> (Girl, Year 12.)

Summary

Student responses to the questions "What is the Mind?   How does it work?" illustrate a range of explanations, the majority of which have origins in philosophical enquiry.   None of the students tested, however, have received any conventional teaching in the subject.   Their education process assumes that building blocks of knowledge lead to concept formation and understanding, and that complex issues such as the philosophy of Mind are dealt with during the tertiary stage of education.

If this is the case, it may be safe to assume that the young people have access to these building blocks of knowledge outside the education system. One source of knowledge may be televised 'popular science' programmes. The Empiricist model of Knowledge, that it is formed through experience, observation and reflection, may provide an explanation of how these concepts form.

It may well be, however, that the concepts have developed endogenously: of themselves as individuals, their consciousness and the world around them, which has produced this understanding.   If this is the case, then the tools which the students use may well be responsible for constructing this knowledge.

The most powerful tools which students use are computers, which provide the user with constant feedback about the problem solving, task management and the thinking process.   Young users have an interior dialogue with Self: the 'Inner Voice' referred to by some; the 'Brain' and 'Thinking' referred to by so many others.

The frequency of responses that utilise an explanation for the Mind that has an information-processing focus – Mind as Control; as Brain; as Thinking; as Storage, are likely to have their origin in the computers used as tools by the students.