

HOW CHILDREN LEARN LANGUAGE: NATURAL MAGIC OR LONG, LONG HAUL?

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I've called my talk: `How children learn language: natural magic or long, long haul, and I'll tell you the answer before I begin: it's a bit of both. Obviously, something must be innate, or even goldfish would learn to talk:

{OHP}

Man talking to goldfish: `So!... you STILL won't talk, eh?'

But learning is also involved: it takes years before children are proficient.

Language involves **innately guided learning**. Children naturally know that they have to make sense of the sounds coming out of people's mouths, and they instinctively know how to do this. But it takes them quite a long time. Yet normal children all get there. Unlike, say birdsong, which humans cannot make sense of:

There were three little owls in a wood
Who sang hymns whenever they could.
What the words were about
One could never make out.
But one felt it was doing them good.

Humans can't understand owls, owls can't understand humans.

But innately guided learning is a type of learning found in animals also, a good example is **bees**. Flowers are very different from one another: roses do not look at all like daisies or dandelions. Bees are not born knowing about flowers, they have to learn. They instinctively know they have to pay attention to odour, colour, and shape, in that order (ref.SS).

{OHP}

Bee: odour, colour, shape: flower

They therefore learn to fly to roses rather than say, bus stops, which are also brightly coloured. Similarly, as I've already said, human infants naturally pay attention to the sounds coming out of people's mouths.

But I'll now briefly go over the stages of language learning, stages that are similar all over the world:

1. PRE-LANGUAGE MILESTONES AND THEIR ONSET

- (a) Crying (birth)
- (b) Cooing (6 weeks), babbling (6 months)
- (c) Intonation patterns (8 months)

Children at first just cry: 'A loud noise at one end, and no sense of responsibility at the other', as Benjamin Franklin supposedly once said. (ref in LW)

{OHP}

Cartoon kid yelling 'Aaaaaah!'

Different types of crying can be identified across different languages: a cry of pain is very different from a cry of hunger. And a Chinese mother or an English mother would be able to recognize these cries in their own, or in babies born to those speaking another language.

Children 'coo', something like 'goo-goo' at around 6 weeks, then they start to babble, producing repetitive ma-ma type sequences at around 6 months. Fond parents sometimes assume that their children is addressing them, though in fact these bilabial sounds are just the easiest for children to make when they start experimenting with their lips and vocal cords (ref LW)

{OHP}

'Mama'

'Aaah!'

'Doesn't she know I'm practising my voiced bilabial nasals?'

The linguist Roman Jakobson wrote a paper entitled 'Why mama and papa?' (1962), pointing out that mama and papa are typical infant sounds onto which parents impose their own meaning. The evolutionist Charles Darwin noted that one of his children said mum, at the age of one year, though appeared to mean 'food'. (ref. in AM).

2. EARLY LANGUAGE MILESTONES

- (a) 1-word utterances: du `juice' (c.12 months)
- (b) 2-word utterances: more du (18 months)
- (c) Questions: where daddy?, negatives: no bed (c.2 years)

Children start producing recognizable one word utterances at around 12 months, such as du meaning `juice', tho they can usually understand much more than they can produce.

They begin to put words together at around 18 months, with combinations such as more du `more juice'.

Simple questions, such as where mummy?, where daddy?, come at around the age of 2, and so do simple negatives, such as no bed `I don't want to go to bed'.

3. LATER STAGES

- (a) Long sentences (c.3 years)
- (b) Uncommon constructions (5-10 years)
- (c) Lexicon (lifelong additions)

Longer sentences come in at around the age of 3, but careful probing shows that there is still quite a lot that children do not know: for example, the sentence: `Bobby is hard to see' actually means `It is difficult to see Bobby'. But 5-year old children usually assume it means `Bobby finds it hard to see'. (Major research on this was done by a psychologist called Rick Cromer, who sadly died of AIDS a few years ago, ref.in AM).

By the age of 10, major constructions are normally in place, even quite complex ones -- but one aspect of language learning continues throughout life, and that is is word learning, acquisition of the lexicon.

4. VOCABULARY: EARLY PROGRESS

- (a) Naming insight (15-18 months)
- (b) 300-600 words (2 years)
- (c) 1,000+ words (3 years)

Children understand some words from a very young age: a youngster I knew, aged around a year, could reliably point to the lion, tiger or giraffe on a mobile that hung above his crib, when a parent said: 'Show me the giraffe'.

But to him it was just a big game: when a parent uttered the word giraffe, he knew he had to point to the animal with a long neck: he probably did not realise that this was the NAME of the animal he was pointing to.

At some point, children discover the power of names, they achieve the so-called 'naming insight' -- the realisation that things have 'names'. They get to this phase somewhere in their second year, typically between 15 and 18 months old. After this, they name everything.

We can't obviously, chat to toddlers about this, but we do know something about this stage from the experience of deaf children, who typically reach the naming insight late. The most famous example is Helen Keller. As a child age 6, she suddenly discovered that words had a meaning, when her teacher held her hand under a flow of water:

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As the cold stream gushed over one hand she spelled onto the other the word water... and somehow the mystery of language was revealed to me. I knew then that 'w-a-t-e-r' meant the wonderful cool something that was flowing over my hand. That living word awakened my soul,... set it free!... Everything had a name...

Helen Keller, 1903

Helen Keller, The story of my life New York: Doubleday 1903

Another, more recent case, is a deaf man called Ildefonso, who discovered the naming insight as an adult. Interestingly, he did it in stages, discovering numbers first, then nouns, then verbs.

{OHP}

NAMING INSIGHT

Ildefonso (deaf adult)

1. Numbers
2. Nouns
3. Verbs

Susan Schaller (1991)

Susan Schaller, A man without words Berkeley, CA: University of California Press 1991.

Everybody agrees, by the way, that there is a word spurt at this time:

{OHP}

Kid knitting up words

-- tho not everybody attributes it to the naming insight,

for example, some psychologists have attributed it to an ability to categorize:

Gopnik, A. & Meltzoff, A. (1987). The development of categorization in the second year and its relation to other cognitive and linguistic developments. Child Development 58, 1523-31.

By the time they are two, children typically know several hundred words, tho they are not all pronounced in an adult way, and by the age of 3, over a thousand.

NB. The figures I quote on word numbers under (3) have been averaged across several researchers, and obviously there is some difference between children.

As you can tell, children are massively more impressive than those 'signing chimps', who mostly know around 200-300 signs, and a maximum of 500.

5. VOCABULARY: LATER DEVELOPMENT

(a) 3,000 active, 10,000? passive (5 years)

(b) 20,000 active (13 years)

(c) 50,000 active (18 years)

At age 5, children have an active vocab of around 3,000 words. The passive vocab is likely to be much larger, an estimated 10,000, tho this is difficult to estimate.

A word surge seems to take place at around the age of 13. I did a survey of the vocab of 11-14 year olds, with a researcher called Anne Koppell. We tested 400 children, 200 at each of two schools, and found that the 11-12 year olds clustered together, on the one hand, and the 13-14 year olds on the other. Most children had acquired 20,000 by the age of 13. This is a critical mass for being able to speak English fluently. (and I found that foreign learners who had reached this total could talk efficiently about any subject, and those with less than this number, struggled).

Adults know around 50,000. For comparison, the COD claims to contain 75,000 words, so an adult knows around two-thirds of the COD. And word learning continues throughout life.

6. SEPARATION OF LANGUAGE AND INTELLIGENCE

- (a) Laura, female
- (b) Christopher, male
- (c) Williams syndrome sufferers

What evidence is there that language is separate from general intelligence? Normally, language and intelligence progresses together, but there are a number of bizarre but gifted humans in which they seem to have been separated.

The first is a female called Laura (Yamada 1990) (originally known under the pseudonym Marta). She used grammatically sophisticated sentences, but these sentences didn't make sense:

{OHP}

LAURA: typical sentences

I was 16 last year, and now I'm 19 this year.

She was thinking it's no regular school. It was just good old no buses.

I don't like him puttin' paper towels in my mouth.

Laura wasn't just repeating pieces of sentences she'd learned, because she also made grammatical errors:

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LAURA: errors

These are two classes I've tooken.

It was gaven by a friend.

I don't know how I catched it.

Another is a male known as Christopher, who had a great skill in learning languages. He was 29 when he produced this translation from Swedish:

{OHP}

CHRISTOPHER: translation from Swedish

Mia is sitting, crouched down in the kitchen sofa with her knees bent and her feet tied up in the lovely night-shirt. The cat spins in her knee.

{OHP}

Accurate translation from Swedish

Mia is curled up on the kitchen sofa with her kneews drawn up and her feet tucked into her stripey nightie. The cat is purring in her lap.

NB. The Swedish word for `purr' sounds very like spin.

Williams syndrome sufferers provide another strand of evidence that language is partially separate from other aspects of intelligence. These are children who cannot cope with spatial tasks, for example they are unable to assemble the components of a bicycle into a whole. Yet their language is sophisticated and elaborate, for example, the following is a description by a 17 year old sufferer, describing a brain scan:

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There is a huge magnetic machine. It took a picture inside the brain. You could talk but not move your head because that would ruin the whole thing and they would have to start all over again. After it's all done they show you your brain on a computer and they see how large it is.

I won't talk about any more of these cases, but another fascinating one is described in my book The Seeds of Speech, a monk who had epileptic seizures which affected his language, but who was able to continue with normal other activities, such as getting off a train at the correct stop, and making his way to a hotel.

7. BIOLOGICAL ADAPTATION

- (a) Tongue, teeth, lungs, etc
- (b) Brain specialization
- (c) Maturationally controlled behaviour

We realise that humans are biologically adapted to language, both physically, and mentally. Physically, the tongue is muscular and mobile, not floppy like the tongues of other mammals, eg dogs. This means it can not only pick up food from around the mouth, but also make a wide variety of sounds. The teeth are even, and although this may not be very good for eating, it does allow one to create a useful barrier in the mouth, against which sounds such as [t d s z l] can be pronounced. The lungs allow one to breath in quickly, and during speech, to breathe out slowly: this adaptation is unusual, because in most cases, breathing can't be altered, yet some humans can talk for hours without discomfort: they are more likely to get a sore throat than have difficulty breathing!

The vocal cords are strips of membrane in the throat which were originally, and still are today, useful for closing off the lungs to make the rib cage rigid for tasks involving effort, such as lifting heavy weights, or (once) swinging in the trees. The larynx is in fact lower in humans than in chimps.

The larynx -- voice box -- is lower in the neck in humans. Our L-shaped vocal tract (like an upside down L) allows a greater proportion of sounds to be made reliably.

{OHP}

Chimp vs human vocal tract [from SS]

Humans can shut off the nasal cavity, and produce recognizable sounds, particularly the three 'anchor' vowel sounds [i u a].

{OHP}

Vowel triangle [from SS]

Our human brains have also become specialized for language. Our brains are larger than those of chimps, particularly the front part of the brain. But it's quality rather than quantity that enables us to talk.

{OHP}

Chimp vs human brain

The left hemisphere is (in most humans) used for language. Most humans are right handed, and over 90% of these have language mainly in the L-hemisphere. Of the relatively few people who are left-handed, most of them also have language mainly in the L-hemisphere. But more L-handers than R-handers have language in the R-hemisphere:

{OHP}

	R-HANDERS	L-HANDERS
L-HEMISPHERE	90% +	70-90%
R-HEMISPHERE	10% -	10-30%

A biologist, Eric Lenneberg, wrote a key book in 1967, entitled The biological basis of language. (NY: Academic Press). He pointed out that language was what he called 'maturationally controlled behaviour', that is, a kind of behaviour rather like learning to walk, or sexual behaviour, in which aspects of the behaviour developed naturally, at particular times in an individual's life, provided that there was sufficient stimulation in the surrounding environment. He provided a number of key points:

{OHP}

MATURATIONALLY CONTROLLED BEHAVIOUR

1. Emerges before it is required
2. Not triggered by external events
3. Not the result of a conscious decision
4. Direct teaching has little effect.
5. Regular sequence of milestones

Eric Lenneberg (1967)

These days, we tend to talk more about 'innately guided behaviour', that is, behaviour in which the general stages are guided by instinct -- but the notion of maturationally controlled behaviour is very similar to that of innately guided behaviour, the latter is just more fashionable terminology. (I've mentioned this older phrase, maturationally controlled behaviour, because I don't want people to forget Lenneberg's contribution to the debate).

8. CRITICAL PERIOD -> SENSITIVE PERIOD

- (a) Lenneberg (1967): fixed period
- (b) Sensitive period
- (c) Changing sensitivity

Lenneberg in his 1967 book argued that there was a fixed 'critical period' during which language acquisition was possible. He claimed that it started at around age two, and ended at adolescence, after which acquiring language was impossible. But it turns out he is wrong about this rigid critical period. He's wrong in two ways: first, children are acquiring a huge amount of language, before the age of two.

{OHP}

LANGUAGE ACQUISITION BEGINS BEFORE 2

1. Damage to LH before 2 is irredeemable
2. Evidence for lateralization in infants.
3. Newborns can recognize their native language

Serious damage to the left hemisphere before the age of two can cause permanent linguistic damage.

Lateralization -- specialization of language to the left hemisphere -- has been detected in infants: 5 and 6-month old babies noticed when sounds and lip movements were not synchronized, when these were presented to the left hemisphere (i.e. sound played into the right ear, and lips shown to right visual field).

Newborns also pay more attention to their own language, suggesting that they have become acclimatized to its rhythms when still in the womb. [refs in AM]

And contrary to Lenneberg, there is no sudden cut off point at adolescence:

{OHP}

LANGUAGE ACQUISITION AFTER 13

1. Some old 'perfect learners'
2. Vocabulary continues throughout life
3. Word formation peaks around age 13

Some adults can learn a language perfectly, even after Lenneberg's so-called 'critical period'.

Word learning continues throughout life

And far from falling away at adolescence, word formation peaks at this age, as already mentioned.

So instead of talking about a 'critical period', these days scholars tend to talk about a 'sensitive period', a time within which children need to be exposed to language, but which starts earlier, and goes on later than Lenneberg's rigid 2-14 window. Nowadays people assume the window of opportunity is open for longer, and fades away gradually - tho it's certainly true that younger brains have greater plasticity than older ones, and families which have migrated to Canada have found that the younger the children were when they arrived, the more easily they acquired French. [ref in Chambers]

But the sensitive period seems to be a time of changing sensitivities. Very young children are particularly tuned in to the sound structure of their language

Older children pay attention to grammatical structures

Teenagers concentrate on vocabulary.

But although children are naturally geared to acquiring language by themselves, and in stages, there's no doubt that the people who look after children can help or hinder. We don't talk about parents, because the person look after a child might not be the parent. We don't talk about 'caretakers' very often, it makes children sound like buildings. The currently 'in' term is 'caregiver'. So let's consider their role.

9. ROLE OF CAREGIVERS

- (a) Problems of correction
- (b) Basis for uptake
- (c) Joint enterprises

First of all, their role is NOT to correct:

{OHP}

PROBLEMS OF CORRECTION

1. Correction can hinder
2. Children may not notice/pay attention to it
3. Parents are inconsistent in correction

Correction can hinder a child, especially if the parent puts on a 'criticizing' voice: children notice this more than what is actually said, they just realise they are being disapproved of: and the same is true of older children acquiring a second language.

There are a number of famous anecdotes in the literature of children who couldn't be corrected:

Child: Want other one spoon, daddy.

Parent: You mean, you want the other spoon.

C: Yes, I want other one spoon, please daddy.

P: Can you say 'the other spoon'?

C: Other... one... spoon.

P: Say 'other'.

C: Other

P: 'Spoon'

C: Spoon

P: 'Other spoon'

C: Other spoon. Now give me other one spoon? [Braine, in AM]

Child: My teacher holded the baby rabbits and we patted them.

Adult: Did you say your teacher held the baby rabbits?

C: Yes.

A: What did you say she did?

C: She holded the baby rabbits and we patted them.

A: Did you say she held them tightly?

C: No, she holded them loosely [Cazden, in AM}

Parents are also inconsisten in what they correct, and they tend to correct `truth conditions' more often than language mistakes: so if a child said : `Teddy sock on' when teddy was wearing a sock, the parent is likely to say: `Good, that's right teddy's got his sock on'. But if the child said the grammatically correct `Teddy's got his sock on' when the teddy wasn't wearing a sock, then the parent would probably say: `No, no, you're wrong'.

In short, as Roger Brown once pointed out, if correction worked, you would expect children to grow up speaking the truth ungrammatically, in fact the opposite seems to be the case. (A lot of people have done more recent work on correction, and have shown it CAN sometimes work IF the child happens to be working on that aspect of the language at that time, and it it's done in a friendly way: children pay selective attention to particular aspects of language at any one time -- and the same may also be true of people learning a second language.

But what we do know is that parents, and teachers, need to provide a good basis for a learner's uptake:

{OHP}

BASIS FOR GOOD UPTAKE

1. Slow, well articulated, exaggerated intonation
2. Short, well-formed utterances
3. Repetitious
4. Grammatical variety

e.g. `Shall we go and feed the rabbits now? The rabbits must be getting hungry. They want their dinner. Shall we give them some cabbage leaves? They like cabbage leaves, don't they?'

10. MOVING FORWARD

- (a) Getting started: `bootstrapping'
- (b) Listen - wait - experiment - confirmation
- (c) Co-occurrence

Children may start out like computers, by setting out on a more simple programme than the one they are eventually going to tune in to. We in England tend to talk about `booting up' computers, Americans tend to talk about `bootstrapping'. For example, a child might form a simple hypothesis, that any sentence begins with a wrpd such as `daddy'. `mommy', then is followed by another word such as car or cup or go `Daddy car', `mommy cup', `daddy go'. Then he or she might realise that there were differences in these utterances, and start to think up why this might be so, and how this affected what s/he was saying. This might enable the child to move on to a more sophisticated type of grammar (tho still an interim one).

In general, we know that when they are working on some aspect of language children tend to listen - wait -- experiment -- listen for confirmation.

So first of all they listen. They learn a lot about their language before they try to speak it.

Then they tentatively experiment: a child called Sally (Sophie) showed how this worked in her acquisition of past tenses. She learned the words broken, taken, and fallen, one December, and got the idea that past tenses ended in -en. So in January she tentatively experimented with one of her own putten. In February she had her -en hypothesis confirmed by hearing given and eaten. This encouraged her to invent boughten, builden, riden, cutten, maden, wanten, touchen, getten. In March she heard waken, and invented haden, steppen, hurten, leaven, bringen, comen, drawnen, hitten, letten, wasen, see-en, rocken, helpen, spoilten, maken, tippen, haven, runnen:

e.g. me tippen that over

me hadden strawberries at lunchtime

me just buyen it

something maken a funny noise.

Eventually, she realised that her non-standard forms didn't fit in with those around, and gradually abandoned them.

But one important aspect of acquiring language is that children are especially tuned in to co-occurrence, that is words and constructions which go next to one another. This was how Kelli, a blind child, learned the difference between look and see. And in her language, she was only fractionally behind seeing children. In general, she used look when an object was nearby, and see when it was further away -- but the syntactic difference was the crucial one.

{OHP}

KELLI: BLIND CHILD

Look, here's how you wind the clock

Come and see the kitty

Landau and Gleitman (1985)

11. RETREATING

- (a) Principle of contrast
- (b) Noticing discrepancies
- (c) Selective attention to input

So far, I've talked about how children move forward, but I haven't said very much about what's sometimes called 'the retreat problem', that is, how they move back from their mistakes. Under (11) on the handout, I've mentioned some proposals that have been made:

The Principle of Contrast suggests that children expect different words to mean different things. Sophie may have noticed that her own form builden, maden appeared to mean the same as her parents words built, made, and decided to emend her form.

A second, related idea, is that children are capable of noticing discrepancies between their own speech, and that of their caregivers, and try to solve the problem.

A third idea, I've already mentioned, is that children work on particular aspects of their speech at different times, and so pay particular attention to what they are 'tuned into' at that time.

12. VARIATION

- (a) Variation between individuals
- (b) Variation between languages
- (c) Bilingualism

I haven't said very much about variation. Language learning by children is in many ways fairly similar, in general outline, particularly in the relative age at which children acquire sections of language. There is inevitably quite a lot of variation:

First, there is variation between individuals. Some children even at a young age seem to want to learn lots of different words -- others tend to want to learn how to manipulate the ones they know.

Second, there is variation between languages, and different language types seem to encourage different strategies among learners. Work by Brian MacWhinney has looked particularly at this.

Third, numerous children grow up bilingual, or even trilingual. This is a great advantage for any child, though parents sometimes get worried, because in households where different languages are spoken, the child is initially less advanced than in a single language household. But this is only a temporary, and very mild stage. Eventually, the child acquires both languages competently. In a bilingual or trilingual household, it sometimes help if different people consistently speak the same language. So if a child knows his father will always speak French or Hindi, and his mother English, then that is often helpful.

But as long as children are exposed to clear examples of one, two or more languages, then they will become competent speakers.

As the American statesman Benjamin Franklin once said:

'Teach your child to hold his tongue: he'll learn fast enough to speak'.

One final point: I've only been talking about language structure, not about general interaction, which is a whole other ball-game which needs to be learned, as in the cartoon sequence

{OHP}
Ring ring

'Hello?' 'May I speak with your father, please?'

{OHP}
'Heck, you don't need **my** permission! Be my guest'

'What a wierdo'

Ring ring

NB. Refs to my own books are given in abbreviated form.

AM The articulate mammal

LC Language change

LW The language web

WM Words in the mind

SS The seeds of speech

For other references, see handout.