Language Learning Lab Newsletter December 2017

https://languagelearninglab-ucl.com/

In the Language Learning Lab, our research investigates many different aspects of language learning, such as how children learn to read and spell in their first language, and how children and adults learn second languages (and whether different approaches work better at different ages). We explore these questions through carefully controlled experiments in which we use games to teach children (and sometimes adults) new words and sentences, and then test them to see how much they learn given different types of training.

Dr Elizabeth Wonnacott

Below, you can read more about some of our findings and ongoing projects. A huge thank you is due to the schools who participated – we couldn't do this work without you and the many wonderful children who participate. We hope that they enjoy taking part as much as we enjoy working with them!

Many thanks also to those language teachers who attended our *"Second Language Learning in the Primary Years"* teachers' workshop last March. The event was a great success – we hope you enjoyed hearing about our research – we certainly learned a lot from you! You can read more about the event on our website at https://languagelearninglab-ucl.com/teachers-workshop/. We plan to hold another workshop sometime in the summer and hope to see you there!

Research projects

Learrning spelling patterns

Dr Anna Samara **Daniela Singh**

Spelling in English is hard - some vowels in English have as many as five different spellings! Despite this, although we now know a lot about how children learn to read, there has been relatively little research into how children learn to spell. We are working on a project which investigates how 7-year-old children learn spelling rules and patterns. For example, we know that in English: 'ck' does not begin words but is a frequent spelling of the same sound at the end of words (e.g., duck); that certain letters do not double (e.g., k, q, u) and those that do (e.g., l, m, e) hardly ever appear in word beginnings; (iii) the spelling of "ea" for the sound in "bread" is quite common in words ending in "d" but is never used in words ending in "n". We know that competent spellers are aware of these patterns, but they aren't necessarily taught about them in the curriculum.

We have been conducting experiments to investigate children's ability to learn patterns of this sort *without explicit instruction* using an alien language called Zorib: children see made-up words spelled in Zorib that embed some untaught (i.e., also made-up) patterns and are tested on their ability to tell apart new words that either "go well" or "go against" the patterns. So far, our work has shown that children can indeed learn some of these new patterns even without being taught them directly: for example, they can learn that, in Zorib, words can end with "s" but not "t"; that the vowel "e" can be followed by "p" but not "s"; and that the vowel

"u" can be preceded by "l" but not "f". Interestingly, some patterns are harder than others: for example, we found that learning that "u" can be followed by double-letters (e.g., ff, ll) whereas "e" can be followed by single letters (e.g., f, l) could only be learnt by 7-year-olds *when we explicitly taught them* the rule in Zorib. We are interested in exploring what makes patterns like these harder to learn (e.g., is it because "duf and "duff" sound that same?) and under what conditions they can be best learnt. For example, can children learn the same patterns if they are encouraged to search for a spelling rule but *are not* told what this is? Also, do the children who do well in the Zorib language tend to be the better spellers in real life too? We hope that these experiments will have important implications for teaching spelling in the classroom.

Foreign language learning

Several of our experiments investigate how children and adults learn the words and sounds of a foreign language. When children learn languages naturally (for example, if they move to a country where a different language is spoken) they are generally very successful, and ultimately more so than adults in the same situation. On the other hand, there is little evidence that young children learn second languages more quickly when they are taught them in the classroom – in fact, they generally learn more slowly than older children and adults. Now that children in the UK learn languages from the age of 7, it is important to understand the different factors which affect how well adults and younger children learn languages. In our experiments, we teach children words from a foreign language using computer games. Some of these experiments only take one day, while in others we teach children these words for as much as two weeks! We then see how much they learnt from these language games and what factors make a difference in learning. Here is some of what we have been looking at:

Learning from multiple talkers: One factor we look at is whether children show better learning when they hear words spoken by multiple people (as would be common when learning your native language) or from a single person (as might happen if you only heard the language from a single teacher). Past research has shown that for adults, hearing multiple people leads to better vocabulary learning - is this the case for children too? So far, our experiments suggest that children do not benefit from hearing multiple speakers, at least in the early stages of learning. For example, in one study we used a computer game to teach 7- 8-year-olds, 10-11-year-olds and adults the words for some objects in Lithuanian. After training, we showed them pictures and asked them to name the objects aloud. We found that adults were more likely to get the words right if they had heard them produced by more than one speaker – as in previous research. However, both 7-year-olds and 11-year-olds showed no advantage of being taught by multiple speakers, and 7-year-olds struggled more during the learning game for the words produced by multiple speakers. This shows that findings from adult language learning do not necessarily transfer to children! An interesting further question will be if hearing more speakers becomes more important in the later stages of children's learning.

Rūta Sinkevičiūtė
Native speaker of Lithuanian

Gwen Brekelmans
Native speaker of Dutch

Learning new speech sounds: Different languages use different sounds - producing a language with the wrong speech sounds is what leads to a foreign accent. One of our studies has looked at English children's learning of vowels in Dutch. We found that children learnt better when they heard the Dutch vowels in the context of meaningful words rather than when we tried to teach them to associate them with letter-like shapes. Current research is investigating how well Dutch children can hear and pronounce different English sounds that do not occur in their native language, and if this changes after they have played English language games every day for two weeks.

Hanyu Dong
Native speaker of Mandarin Chinese

Learning "tones" in Chinese: These experiments look at children's learning of a very different language – Mandarin Chinese. Unlike English and most other European languages, Mandarin uses "tones" to change the meaning of the word: if you say "ma" with a high flat tone it means "mother", but if you say it with your voice falling then rising it means "horse". These tones are difficult for second language learners. We have created a game for teaching children and adults words in Mandarin which differ in their tone. We find that both adult and children can learn the words by playing the game, and at the same time their associated tones. This learning occurs even without any explicit instruction about the tones. In fact, our results so far suggest that adding in additional direct instruction about the tones makes no difference to their learning. Current ongoing studies look at how individual differences such as musical background and memory affect Mandarin learning. We are also looking at whether children learn tones better when they are taught in person, rather than through a computer game, and whether they learn better when taught using hand gestures to represent the tones.

Gianna Li
Native speaker of Cantonese Chinese

Jessica Pu
Native speaker of Mandarin Chinese

Learning a new grammar: As well as learning the words of a language, we also have to learn aspects of the grammar. For example, many languages divide nouns into different "gender classes" which affects the words they combine with. For example, in Italian, if you want to say "the bed" the word for "the" is "il" ("il letto") because "letto" is masculine, but in "the house" the word for "the" is "la" ("la casa") because casa is feminine. English learners often have difficulty with gender. Our experiments have shown that 7-year-olds can naturally pick up on these patterns of usage when learning words via a computerized game, although they have difficulty extending the patterns to new words (they don't learn that, in general, words ending in "-o" go with "il"). New experiments are exploring whether it is helpful to try to get children producing the words more frequently during training, and giving them more feedback along the way.

Next term we start a new project looking at grammatical learning in a new language –

Japanese. We hope to tell you more about that in the next newsletter!

The findings from these experiments may have implications for methods of foreign language learning that could be used in education.

Exploring learning through artificial language learning experiments and computer modelling

Some of our experiments involve teaching children and adults an *artificial* (i.e., made-up) language with new words and new types of sentences. One advantage in taking this approach is that we no longer need to control for *how much children already* know (which can be very hard to measure accurately). We use these methods to explore different questions as theories about how we learn language, for example as:

Dr Anna Samara

Avoiding over-generalization

When children learn their mother tongue, they sometimes make errors such as "he giggled me!" "she fell me over!" or "carry me teddy". Learning to avoid these mistakes in English (and many other languages of the world), involves learning that some verbs can appear in a two-person sentence (e.g., "Bob tickled Wendy"), while other verbs cannot (e.g., "Bob giggled Wendy"). Evidence suggests that children get little direct correction for these types of errors, yet they eventually they stop making them. What *discourages* children them from producing such incorrect sentences in the long term? A series of experiments with adults (which we are currently adapting for use with Year 1 children), suggests that *frequency* may be the key: *repeatedly* hearing the verb "giggle" within sentences that mean "causing someone to laugh" (e.g., "The funny clown/the teacher made the audience/the students giggle") gradually discourages speakers from using it in a two-person sentence: simply put, learners seem to work out that if "Bob giggled Wendy" was right, they would have heard it by now. This fits with the findings of some computational models of generalization, such as certain types of neural networks.

Maša Vujović

Learning word meanings: How do children learn meanings of words? A child learning English might observe that furry, four-legged animals are called *dog.* One day, the child might see a fox and expect to hear "Look, *doggy*!" This generalization is sensible – foxes and dogs look very much alike. How, then, does the child learn that distinctive quality that makes us call an animal *dog*, and not *fox*? According to one approach to learning in psychology, called *error-driven learning*, exactly these situations in which a child sees a furry, four-legged animal and expects to hear "*doggy*" but hears "*fox*" instead, are necessary for the child to learn that, while *furriness* and *four-leggedness* are reliable qualities of dogs, they can't be what makes us call dogs *dog*, because foxes, too, are furry and have four legs.

In order to test the error-driven learning approach, we built a computer model of learning. We use this model to teach the computer an artificial language, where objects with curly antennae are called "joob" and objects with spiky antennae are called "feep". We then teach adults and children the same language in an artificial language learning experiment, and compare how the humans and the computer learned the language. The advantage of this approach is that the computational model gives

us a precise basis against which we can compare human learning.

Dr Catriona Silvey

While furriness and four-leggedness are easy for a child to observe, not all word meanings are based on such clearly perceptible features. Spatial relation words like 'in' and 'on' are much more abstract: an apple *on* a table looks very different from a picture *on* a wall, despite being described by the same word in English. For a child learner, it is crucial to hear the word 'on' applied to a variety of situations by adult speakers. This prompts the child to compare the situations, discover their common abstract structure, and thus learn the word's meaning. We plan to use artificial language experiments to find what sets of situations are most helpful for children to compare in order to learn the meanings of novel spatial relational words. The findings will not only increase our understanding of how children learn these words, but also give insight into the processes that support later learning of yet more abstract relational words (e.g., mathematical operators) that are important for academic success.

Learning patterns of language usage

Chantal Miller

Dr Anna Samara

Languages have multiple ways of saying things! What some speakers call "dinner", others call "supper"; some people use the word 'cool', whereas others prefer the word ''awesome'.

Cheryl Chew

In some cases, choosing between *alternative forms* such as those described above depends *on aspects of our identity*: Among adults, males and females often have difference preferences, and so do younger and older speakers, or speakers of different dialects. But how early on do children learn that word choice/pronunciation may depend on such cues?

We address this question by teaching 5-year-olds an artificial language where word choice depends on whether the speaker is male or female. For example, boys in this language refer to a picture of two rabbits as "rabbit gos" whereas girls describe it as "rabbit kem". So far, we have shown that 5-year-olds can indeed track the gender cue (without being explicitly told to look for a cue) from languages featuring either one male/female speaker or *multiple* male/female speakers; and that they use the cue correctly to guess what boys/girls would have said. We are currently running an experiment testing whether children are also more likely to produce words that align with their own gender: that is, whether boys prefer the words produced by male speakers and vice versa for girls.