**Priming and implicit learning: A summary for foreign language teachers**

**What is priming?**

* Priming is our tendency to reuse (i.e., productive priming) or be more likely to expect (i.e., receptive priming) a specific language feature if we have just encountered it.
* Priming effects can occur for different aspects of language. Among the features that can be primed are the meaning of words (semantic priming), morphology such as verb inflections (morphological priming), and syntax (syntactic or structural priming).
* *Structural* priming research usually focuses on pairs of syntactic structures that can be used interchangeably in the same situation. These studies investigate how the likelihood of using one structure (A) over the other (B) can increase following exposure to the first structure (A). One example of such a pair of features is the direct dative (e.g., *Susan gave Henry the keys*) and prepositional dative constructions (*Susan gave the keys to Henry*). Being recently exposed to one of the two dative structures makes participants more likely to use it in subsequent production and less likely to use its competitor.
* Structural priming has been observed in native speakers as well as second language (L2) learners (Kaan & Chun, 2018). *Artificial language* learning studies suggest that structural priming *can* occur even at the early stages of learning a L2 (Weber et al., 2019).

**Is priming a type of learning?**

* Structural priming effects are normally observed in the very short term (i.e., within seconds or minutes of initial exposure), but there is some evidence that they can last longer. Branigan & Messenger (2016) showed that 3- and 4-year-olds became more likely to use passive structures to describe a scene after being exposed to passives, and the effect was still detectable a week after exposure. As some priming effects have been found to last beyond the immediate term, it has been suggested that structural priming could constitute a form of *implicit learning* (Chang et al., 2006). However, there are limitations to consider when thinking about the relevance of priming to language *teaching*:
1. **Priming effects are not consistently observed in L2 learners**
* First, L2 priming effects vary a great deal, and are not observed consistently across different linguistic features. Priming effects can vary depending on characteristics such as the frequency of the features and whether they are similar in the learners’ first (native) language (L1).
* For example, Weber et al. (2019) found priming effects only for the structures that were also found in the learners’ L1. Anotherstudy (Jackson and Ruf, 2017) compared the priming of two different types of fronted adverbial among intermediate English L1–German L2 learners. Priming effects lasted longer for the adverbial that is more frequent in English (the temporal adverbial). So, being exposed to temporal fronted adverbial phrases (e.g., *Im Winter trägt Paul eine Jacke*; “In winter, Paul wears a jacket”) led to priming effects both immediately after exposure *and* in a subsequent test on the same day. By contrast, the less frequent *locative* fronted adverbial phrases (e.g., *Auf dem Berg trägt der Schüler eine Jacke*; “On the mountain, the pupil wears a jacket”) only elicited short-lived priming effects immediately after exposure.
1. **Prior knowledge is needed for priming to take place, and, even then, it may not happen**
* Second, priming can strengthen and fine-tune *existing knowledge*,but it does not lead to the formation of new representations: for priming to occur, learners need to already have some knowledge of the feature (e.g., its form and/or its meaning) to be primed.
* For example, in a study of L2 learners of Esperanto, priming for new syntactic structures only emerged if participants had *already* identified the structures and their meaning (McDonough & Fulga, 2015). Another study investigated priming for different types of dative constructions among L2 English learners. It found that prepositional dative constructions (which are acquired earlier) elicited both immediate *and l*ong-term priming effects, whereas direct dative constructions (which are generally acquired later) only elicited immediate priming effects, and only for learners who could *already* produce direct datives at the beginning of the study (McDonough, 2006).
* However, priming may not appear even when learners can show knowledge of the structure. Marsden, Williams, & Liu (2013) investigated whether new suffixes could be primed immediately after exposure. Participants were taught an artificial language with verb stems and different verb suffixes to express singular vs. plural and present vs. past. Participants acquired some knowledge of the suffixes if the task directed their attention to the meaning of the stem + suffix combination, and very good knowledge if they were given explicit instruction and the task forced them to focus on the meaning of the *suffix*. However, no priming was observed for the suffixes, regardless of how the participants were taught.

**Can we learn a second language implicitly?**

* While priming itself does not generally allow us to learn *new* things, there are other ways in which learning can happen implicitly. Implicit learning has been defined as *incidental learning resulting in implicit* knowledge (Williams, 2009): that is, a kind of learning where participants acquire new knowledge without explicitly trying to, and without becoming aware of what it is they have learned. *Implicit knowledge* is unconscious and automatic (and so can be difficult to observe and measure); *explicit* knowledge can be consciously accessed and used (Williams, 2009).
* It is widely assumed that we acquire our L1 mostly implicitly. We know what sounds right and what doesn’t, even though we may not always be able to explain why. The development of implicit knowledge has also been considered the goal of L2 acquisition by some researchers, such as Krashen (2013) who famously distinguished between ‘learning’ (explicit) and ‘acquisition’ (implicit).
* Some research has shown that it is possible to learn some linguistic features implicitly, including morphology, syntax, and verb usage (Paciorek & Williams, 2015; Rebuschat & Williams, 2012; Williams, 2005).
* Taking advantage of a learning process by which implicit knowledge could be acquired directly and without effort may seem very appealing. Again, however, there are important limitations to consider when thinking about whether, and how, implicit learning could be relevant to language teaching:
1. **Learners’ attention must be directed to the relevant features**
* First, simple exposure may not be enough: it helps when learners’ attention is directed towards the feature to be learned, including both its form and its meaning if that is the target of learning. Marsden, Altmann, & St Claire (2013) examined whether secondary school pupils (aged 13-14 and 16-17) could develop knowledge of a French verb inflection (*-ons*) through exposure under two different conditions: one that oriented their attention to the form and meaning of -*ons*; another that oriented attention on whole sentence meaning. Priming effects were used as a measure of learning, using an auditory lexical decision task, where participants pressed buttons to indicate if they thought they heard a real word versus a made-up word. Responding faster to words with *-ons* that had been encountered in the priming phase, compared to words that had not been, would indicate priming. The study found that the French inflection *-ons* could be primed (so, it had been learned to some extent prior to the study – recall that for priming to happen, learners must already know the feature). However, priming was only found *if the exposure had focused attention on the form/meaning of the -ons, and not on sentence meaning.*
1. **The influence of the first language can impact learning**
* Second, even if our attention is directed to a feature, if that feature is not also found in our L1 we may still not be able to learn it without receiving an explicit explanation. When babies learn their L1, they are ready to pick up any type of language feature. By the time we have acquired our L1, however, we have learned to focus our attention on the kind of features that are important to our language, but not others (MacWhinney, 2005).
* For instance, Leung & Williams (2014) investigated the implicit learning of classifiers derived from Mandarin Chinese, which do not have an equivalent in English. The participants’ attention was oriented to the classifiers during exposure, but without explaining the rules. While L1 Chinese speakers could learn the new system without becoming aware of it, L1 English learners of Chinese could not. These findings suggest that it is hard to acquire features that are not found in our language (e.g., French gender marking for English speakers) if our attention is not explicitly directed to them.
1. **Implicit learning yields small learning effects**
* Any implicit learning effects are usually (very) small. These effects are statistically significant, so they are interesting for research purposes, but they are far smaller than the learning we would generally like to see in teaching. On average, learners score just above chance level (i.e., the score they would probably get by just guessing): if learners are tested with two-alternative multiple choice tests, scores are typically around 60%, against a chance level of 50% (Chen et al., 2011; Williams, 2005).
* Small learning effects are partly due to the fact that implicit learning is usually slow: learning our L1 requires years of daily exposure, far more than the time available for foreign language learning. In contrast, more explicit types of instruction reliably outperform more implicit approaches, given the same amount of time, as shown by meta-reviews of research (Goo et al., 2015; Norris & Ortega, 2000; Spada & Tomita, 2010). Also, learning effects among ‘aware’ learners are often larger relative to unaware learners (e.g., Marsden et al., 2013; Williams, 2005).
1. **Automatised explicit knowledge shares many key characteristics with implicit knowledge**
* For the purposes of classroom teaching, one potential way to access the benefits of implicit knowledge is *proceduralisation and automatisation*. According to skill acquisition theory, proceduralisation happens when learners move away from a reliance on declarative (explicit) knowledge stored in *declarative* memory, towards a greater reliance on *procedural* memory (similar to implicit memory systems), as their mastery increases through practice to become automatic (Anderson, 1996)—e.g., when learning to drive a car. For proceduralisation and then automatisation to take place, *learners need to establish the relevant explicit knowledge, and then engage in tasks that require them to employ that knowledge.*
1. DeKeyser (2003, p. 329) argues that automatised explicit knowledge is “functionally equivalent” to implicit knowledge—meaning that it can be accessed rapidly and with little effort. When the declarative and proceduralised knowledge are established under appropriate and varied conditions, this can support automaticity in both production and comprehension.

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