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# On L2 lexical learning abilities

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## 0. Purpose

In the body of work on L2 lexical acquisition, the question of L2 word learning[1] abilities has never been addressed. It seems to be tacitly assumed that the word learning faculty (whatever its exact characteristics) is the same across acquisitional types. In this paper, we report on data from 3- to 6-year-old bilingual preschool children, raising two important questions. First, how can progress in early L2 lexical acquisition in a preschool programme be quantified and, second, what are the underlying mechanisms in L2 lexical acquisition? In order to answer the first question, we report on a number of simple tests to evaluate early knowledge of lexical items and formulas. In order to answer the second question, we present studies on fast mapping and lexical principles.

## 1. Introduction

Some researchers apparently assume that "mastering the vocabulary of most European languages simply means learning to recognize a number of old friends under slight disguises" (Sweet 1972 as quoted in Odlin 1989, pp. 64f.). According to such a view, it is not surprising that it remains entirely unclear which theoretical questions should be asked in connection with the development of an L2 lexicon. A priori, developmental sequences do not seem to be expected:

> Interlanguage theory has traditionally had very little to say about the lexical behaviour of non-native speakers. None of the main sources discuss learners' lexical problems in any depth, and most of them ignore the question completely, or treat it in a very superficial fashion (Meara 1984, p. 225).

Similar complaints uttered in more recent studies (cf. Laufer 1986, Zobl 1989, Boyd Zimmerman 1997, Coady 1997, see Daniel 2001 for a review) suggest that the situation of research on L2 lexical learning has not fundamentally changed, although, at least, there has been an increasing interest in L2 classroom vocabulary learning. However, research in naturalistic L2 lexical acquisition is still in its infancy. Apart from a number of studies mainly conducted in the late eighties and early nineties under the auspices of Henning Wode, there are only very few individual reports available

1 There is no distinction made here between "learning" and "acquiring" and both are used as synonyms for stylistic reasons. In his Monitor Theory, Krashen (1981, 1982) clearly distinguishes the two terms. However, there is no conclusive evidence to justify this distinction (see also Ellis 1994).

(these include Yoshida 1978, Rescorla & Okuda 1984, Broeder et al. 1988, 1993). Why has L2 lexical acquisition not evoked more interest in the past? It could be assumed that the L2 acquisition of a lexicon is less interesting than the acquisition of L2 morpho-syntax or L2 phonological systems as it is implicitly believed that the lexicon is not subject to any critical period (Bohn 1996, Singleton 1999).[2] New words can obviously be added at any time be it in one's L1 or L2. Research from the Kiel Project on language acquisition directed by Wode suggests that both L1 and L2 learners make use of the same word-learning abilities (Wode 1987, 1988/1993, Wode et al. 1992, Wode 1999). However, the question of how any word-learning faculty is put to work in L2 acquisition was never addressed in the above-mentioned studies. In the following sections, this and another question are dealt with in some detail. Firstly, how can early receptive L2 lexicons be quantified, i.e., measured, especially in view of a lack of productive data? Secondly, what constitutes the ability to learn words, and to what extent does this ability possibly differ in the two acquisitional types? The data discussed are drawn from a bilingual preschool programme in Altenholz near Kiel.

## 2. The bilingual preschool in Altenholz

After finishing the extensive research on late partial immersion programmes in German secondary schools, Wode set about extending the North German experience with regard to bilingualism. It had been shown that the immersion method could be successfully implemented in a German context (see Burmeister & Daniel, this volume). Thus, Wode intended to win a German preschool to run a bilingual programme. The underlying idea was extremely intriguing for everyone involved: If young children profit from their language acquisitional abilities (which are, of course, not limited to mono- or bilingualism) as early as possible, they could learn an L2 without any conscious effort and, more importantly, without any formal instruction. If, then, the acquired skills can be maintained or even extended during primary school (see Imhoff et al., this volume), there would be sufficient space for additional languages in the course of secondary school. Mastering at least two languages fluently is especially desirable in view of a unified Europe in which bilingualism will be a prerequisite to be able to tackle the upcoming challenges.

After an initial project conducted in a German-French preschool[3] in Rostock (see Westphal 1998), Wode found a preschool in Altenholz on the outskirts of Kiel in the northern-most German Bundesland, Schleswig-Holstein. This AWO *(Workers' Welfare Association)* preschool implemented a German-English programme in 1997. Since then two groups (out of a total of five), each consisting of about 20 children

2 This is not, in turn, to imply that it is entirely clear whether there is a critical period in the sense that an L2 structure cannot be learnt in a native-like manner from a certain point onwards (cf. Harley 1986; Scovel 1988; Singleton 1989; Wode 1994; papers in Singleton & Lengyel 1995; Hyltenstam & Abrahamsson 2000; MacWhinney, this volume; Pilch, this volume).

3 We are using the term 'preschool' instead of 'kindergarten' in order to make clear that in this type of institution no formal instruction of any kind is involved in the setup.

aged 3 to 6, have been run by both a native German and a native English preschool teacher. Both languages involved are promoted to the same degree. The English speakers do not teach the foreign language but simply use it for all daily preschool routines and in conversation with the children, applying the "one-person-one-language-principle" (Döpke 1992, Baker 2000). The English speakers generally do not use particular teaching materials, instead, English is promoted in a way that children can acquire the language naturalistically. It has to be stressed, however, that English is not the ambient language of the environment and, as a native language, is restricted to two speakers. Thus, the acquisitional situation is not comparable to being exposed to English in a country where it is spoken as L1.

## 3. Quantification of early lexical learning

From its inauguration in 1997 until the conclusion of the reported projects on lexical learning in 2001, the bilingual programme was accompanied by a research group from Kiel University. The research group visited the preschool on a weekly basis, first simply taking notes, later conducting a series of experiments to address the question of L2 lexical learning abilities.

The diary data collected in the first few months of L2 exposure revealed that, during the first week of contact with English, most of the children were passive, silent and shy. Some even denied the existence of words in a language other than German (possibly sticking to the principle of *mutual exclusivity*, see below). Upon the introduction of the English noun "frog", one child was irritated, *"Das heißt nicht so, wie du gesagt hast. Das ist ein Frosch, Frosch, Frosch!"* ("This is not what it is called. This is a frog, frog, frog!"). From the second week onwards, all children accepted the co-existence of two languages, and a conversation pattern developed: The caregivers spoke English and the children responded target-like in their L1, German. After about three months, the children started to integrate familiar English words into their German utterances, e.g., "*Ich habe einen* dog." ("I have a dog.") The children's first complete utterances in English were (mostly reduced versions of) high-frequency formulaic expressions, such as "tidy-up time", "tie my shoes, please", "pass me the milk, please" etc. (see Petit, this volume). The observations from the first year of experience can be summed up as follows: Receptive abilities are far superior to production. Whereas the children hardly used English themselves in the first year, they reacted appropriately to the English input they received by replying in German, be it to questions, suggestions or orders.

### 3.1 Non-standardized picture and formula tests

How can we gauge the individual child's comprehension of English? Standardized tests are not available for bilingual preschools and children aged between 3 and 6. Consequently, tests had to be designed to capture two aspects of lexical development: Vocabulary development and the acquisition of the above-mentioned formulas. The

tests had to be adapted to the children's specific situation. They had to be short, playful and conducted in a non-threatening fashion. The children were tested separately in a small quiet room adjoining their main group area in the preschool. Testing materials were carefully selected and administered in cooperation with the English caregiver.

The aim of the vocabulary test was to assess both active and passive knowledge. It consisted of a set of coloured picture cards and was administered in two steps: In the comprehension section, the children were supposed to pick the appropriate picture out of a total of four, which were given on a sheet of paper. There were 21 sets altogether. The interviewer used the instruction, "Show me the ...". In the production section, the question was, "What's this?" and the children were supposed to name 24 single pictures in the pretest and 26 in the test. The tested semantic fields comprised jobs, fruit, animals, objects, body parts, colours, and numbers from one to twelve.

The results showed great inter- and intra-individual variation. Listening comprehension was far superior to production. No differences were found as to the age factor or with regard to sex: On average, the boys could boast 56 target-like answers in contrast to 50 for the girls. This result, however did not prove to be statistically significant. Regarding the different semantic fields involved in the test, colours, numbers and animal names were learnt more succesfully than labels for utensils, jobs, and body parts. It has to be stressed that all the depicted entities chosen had been checked to be familiar for all the children with the English caregivers.

The formula test was designed to assess the knowledge of formulaic expressions used in the daily routines, whose meanings had never been made explicit. To this end, a short puppet play had been written by the research team. The plot saw an English-speaking bear trying to communicate with a German-speaking duck, with the tested child being supposed to help out and translate. Puppets were used, because children enjoyed playing with them and took the test situation to be a game (Weber & Tardif 1991a,b). The children loved this setup and queued to be tested. The conversation between the puppets consisted of English and German formulas such as "*Good morning, How are you?, Toothbrush time, Can somebody take the milk back to the kitchen?*" The handpuppet animals used their own language (either German or English), therefore, the tested children had to switch from one language to the other as well. A pre- and post-test design was used: The English formulas used in the pretest, which had to be transferred into German, were asked in German in the test and had to be transferred into English.

The results were analyzed with regard to intra- and inter-individual variation, considering the factors age and sex. Various different answers turned out to be possible translations of English and German formulas and were thus accepted as target-like. A formula was, e.g. translated as expected, such as "*Morning circle*", or, alternatively, was modified; e.g., "*Good morning*" was substituted for the pragmatically correct "*Hello*"; or it could be partially appropriately translated, instead

of saying "*Can I have the juice, please?*", the formula was reduced to "*apple juice*". Another possibility was that the child her/himself answered a question pragmatically appropriately, such as giving her/his own name when the actual purpose was to translate "*what's your name?*" As with the previous test, great individual differences became apparent. The degree of inter-individual differences can be seen when comparing the results of two children in the pretest. The "best" child scored 77% of target-like answers on the pretest, the least successful reached a percentage of 36%. In terms of the intra-individual variation, two participants' results remained stable from pretest to test, four children produced less good results, and five of the children improved. On average, in each test version, 53%, i.e., seven formulas, were answererd in a target-like or partially acceptable manner. However, production was poor in the pretest. Here, a relation of 80 to 16 (comprehension of English formulas versus production of English formulas) was found, whereas in the test the relation was 46 to 45. This means that the number of target-like English utterances tripled (for details, see Tiefenthal 1999).

### 3.2 The British Picture Vocabulary Scale

In order to gauge the children's passive or productive lexical knowledge, any standardized instrument, like in L1 acquisition, is not only supposed to count the total of words a child knows but has to take into consideration the age factor, i.e., the performance expected for a particular age. For L1 acquisition, this is not problematic as there are clearly fixed reference scores for a particular age group (see below). For L2 acquisition, there is the additional problem that the amount of L2 exposure has to be taken into account as well as the quality of the input. A test instrument which is sensitive to these factors can therefore only be developed for specific purposes as L2 contexts may differ drastically from each other. With regard to the preschool in Altenholz, this means that any instrument measuring lexical knowledge has to be standardized for this very preschool with the help of longitudinal studies. Vocabulary tests based on different L2 input conditions can only supply inexact data as the children are not matched with their likes.

Inspite of the caveats mentioned, an attempt was made to measure the German children's English vocabulary comprehension using the British Picture Vocabulary Scale (BPVS) (Dunn, Dunn, Leota, Whetton & Burley 1997). This is the British adaptation of the US-American Peabody Picture Vocabulary Test (Dunn 1959, Dunn, Dunn, Leota & Williams 1997).

The BPVS had not only been conceived for L1 children but also for children acquiring English in England as their L2 or as an additional language (EAL). For this purpose, the test was standardized for 410 EAL children aged 3;0 to 8;5. The obvious difference between these EAL and our preschool children is the environment in which English is acquired. For the former it is the ambient language, for the latter it is not.

The BPVS was administered in Altenholz over a period of 18 months to investigate the children's vocabulary at three different times, each child being tested once in six months. As expected, the results turned out to be very misleading. For some of the children it appeared that their passive lexical knowledge actually diminished over the 18-month period. This effect, however, was due to a major weakness in the BPVS: In order to be entitled to be tested beyond the first test set, there may only be one incorrect answer out of a total of 12 in the starting set (each set consists of 12 plates containing four pictures each). If there are two or more errors in the starting set, testing is discontinued. The two critical items in the starting set turned out to be pictures of a drum and a gate. The children performed at random given the instructions *show me drum*[4] or *show me gate*. Many of the preschool children simply do not know these two words as they have as yet been irrelevant in the preschool context and therefore have not been introduced by any of the English native speakers. The problem was, however, when only one error was made, the following test sets were administered as long as a total of eight errors occurred (the ceiling set). If there were two errors in the starting set, testing was discontinued. Thus, a few children were tested beyond the starting set at time 1 and obtained a considerable score (up to eight errors could be made in the sets following the starting set). At time 2, however, the same children failed to respond appropriately to either *gate* or *drum* or both (chances are always 1:4) and were not tested further so that the score was considerably poorer. In other words, in some of the cases it was accidental whether or not a child managed to get beyond the starting set.

Despite the shortcomings of the BPVS for our purposes, it has to be stressed that, after a period of 18 months, four of the twenty children tested obtained scores that proved to fall within the range of respective EAL norms. Thus, in this specific L2 context, in which English is not the ambient language, it is possible to build up a receptive lexicon that matches the lexicon of EAL children acquiring English in England.

## 4. Qualitative aspects of lexical learning

For L1 acquisition, a correlation is assumed for three phenomena that can characterize lexical learning at about 18 months: 1. The ability of *fast mapping,* i.e., the child memorizes a word/referent mapping after very few exposures to that word (Carey & Bartlett 1978, Heibeck & Markman 1987), 2. The ability of *exhaustive sorting,* i.e., the child is able to place objects of one type into one location and those of another type into another location (Mervis & Bertrand 1994, Gopnik & Meltzoff 1997), 3. The *word spurt:* At about 18 months of age, after a drawn-out phase where 20-80 words are accumulated, suddenly 50 and more words per week are added to the child's lexicon (Dromi 1987, Goldfield & Reznick 1990, 1996, Mervis & Bertrand 1995). Some researchers suggest that the prerequisite for these characteristics of early lexical learning, in turn, is the availability of *lexical principles,* i.e., default assumptions about potential referents for words (Markman 1989, 1992, 1994a,b, Woodward 2000a,b).

4 Articles are avoided as the test questions also elicit verbs and adjectives.

In the following section, one of the above-mentioned charateristics, *fast mapping*, is discussed with regard to the L2 acquisition of English by the German preschool children. The other two characteristics observed for L1 acquisition were not considered since *exhaustive sorting* is taken to be a cognitive rather than a purely linguistic skill and a *word spurt* in word production could simply be ruled out by informal observation (for a *word spurt* in L2 acquisition see Wode et al. 1992, Rohde 2001). The remainder of this chapter is dedicated to the availability of lexical principles in L2 acquisition.

### 4.1 Fast mapping

A number of experiments were conducted in order to compare German children's L1 and L2 fast mapping abilities. Such a comparison is not trivial as the quantitative data discussed above suggest that the children in the bilingual preschool programme proceed slowly in their lexical acquisition even after one year of exposure and more. The pilot study on fast mapping was based on the pioneer experiment by Carey & Bartlett (1978) and simply involved the introduction of a new noun, *swop*[5], for a toy moose wearing a blue cap (Rohde & Tiefenthal 2000). The new toy and label were introduced in an interactive session with the children along with another two familiar toy animals that the children could already name, an elephant and a dog. 27 L2 and 15 monolingual German children participated in the experiment, which comprised of three parts: 1. The introduction of the novel label, *swop* for the L2 children, *Glopp* [glɒp] for the monolingual German children. A multiple choice assessment, and 3. A production or comprehension task depending on whether the second part was successful. In the introductory interaction, each child was given the opportunity to handle the toys and the novel label *swop* was heard ten times. In the second part, each child was tested individually in a separate test room with a 24 hour delay. There were now seven different objects presented on a table, the three familiar toy animals including the *swop* (the moose), another toy animal (a hippopotamus), a handbag, a tea strainer, and a garlic press. The tea strainer and the garlic press represented unfamiliar objects, the remaining ones were used as distractors. With the help of a hand puppet, each child was asked to find the swop (instructions for the L2 children were in English). Depending on whether the children picked the target item in the multiple choice task, they were either assigned a production or comprehension task. Of the 27 L2 children who participated, 12 were able to find the *swop* and were thus asked to produce the new term after another 2-hour delay. The remaining 15 children were assigned another comprehension test two hours later. Four of the 12 children were able to produce the novel label or at least a phonetic form similar to the original one. In contrast, all 15 monolingual German children found the *swop* in the multiple choice task 24 hours after the introduction of the novel toy and label with 9 of them also being able to produce the German sounding [glɒp] two hours later.

5 *Swop* is of course an existing English word, however, it was checked with the caregivers that the children had not heard this word before, especially not in this context.

Why are the monolingual children more successful in their ability to understand a novel label after a 24 hour delay?[6] Rohde & Tiefenthal (2000) concluded that fast mapping in L2 acquisition may be less effective than in L1 acquisition. Novel English words may not be as salient for the children in connected speech as German-sounding words in a German-speaking context. The L2 situation may still require more effort to follow utterances in English than in German, all the more that English is not the ambient language of the environment.

### 4.1.1 The experiments

Eight follow-up experiments were conducted over a period lasting two years in order to investigate the influence of various factors on the success of fast mapping, such as word class (most of the available L1 studies were concerned with nouns), the medium of introduction (a game, a song, a video film), the temporal delay between introduction and test, the amount of new words introduced, the frequency of labelling a new object, sex, age and the children's quantitative vocabularies in one lexical field that they bring to the task. All the experiments discussed in the following were also conducted with the monolingual German children (see Tiefenthal, in prep.).

In two of the experiments, the acquisition of two novel verbs was investigated. In one of the tests, two novel nonce verbs, *to slope*[7] and *to feaf* were introduced. While the children were sitting in a circle, they were presented with two coloured posters showing a cat performing two familiar actions. One saw the cat painting on an easel ("Look, the cat is sloping"), and the other one showed the cat whistling ("Look, the cat is feafing"). Apart from the question whether verbs could be memorized like nouns, one of the questions was whether the phonological resemblance between *feafing* and German "pfeifen" helped the children remember the word (the similarity only fostered subsequent production not comprehension). The children were asked to show the "sloping" and "feafing" actions within a total of four posters, the other two showing the cat singing and running respectively.

In order to test the children's fast mapping of adjectives, the same design as in Carey & Bartlett (1978) was used. The children were asked to put differently coloured strips of paper into matching boxes. One of the colours, olive green, was referred to as *chromium.* Comprehension of the novel adjective was tested both one day and one week after the introduction game. In yet another test, the subjects were confronted with two new labels for toy animals to test fast mapping with two nouns rather than one. In addition, one of the animals was labelled once and the other one twice during the introductory game.

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6 It can be ruled out that the test instructions were not understood as it was established several times that the children knew what was going on.

7 As with the novel label *swop* discussed above, there obviously is an English verb "to slope", albeit with a completely different meaning.

One problem that occurred in the preschool was that, in general, 40 children acquiring English as L2 were available for testing. Thus, a sufficient amount of time had to elapse until one and the same child could be tested again for yet another fast mapping test, otherwise the children would have quickly become "test-wise", i.e., they would have been aware of the purpose of a given experiment and any results would have been useless. In order to bypass the problem, several months elapsed between tests and numerous games were played with the children between test phases which did not involve any data elicitation. Another method to prevent children from becoming test-wise is to involve them in activities in which new words are not highlighted in any way but rather used incidentally. This was attempted with a game in which children were asked to attach four wheels to a race car, then race the car down a ramp until it crossed the finishing-line. It was announced to be a competition as the time the children took for the course was timed on a stopwatch. The new label, *veb*, for the tyres was used incidentally, either once, five times or ten times. However, this design proved to be far too exciting for the children as nobody remembered the new label after 24 hours when the task was to find a referent for the label *veb*.

Since the described design proved to be too overwhelming, it was decided to make use of a typical preschool routine for introducing new labels. A children's song, "There was an old woman", was selected, which included ten real, unfamiliar English words belonging to different word classes. As the singing of songs is an integral part of preschool life, the children did not suspect a fast mapping test behind it. In the introductory part, the children listened to the song, the new words were explained utilising pictures and gestures, and the bilinguals sang along while pointing to the pictures. The new labels were tested on the following day using a number of picture cards.

A different fast mapping experiment used was based on Rothweiler (1999)[8], who introduced a number of new German words within an animated film on video. Rothweiler's video was used and adapted for the L2 preschool children by dubbing it into English. The procedure used was the same as in Rothweiler (1999). The children watched the video sequence twice within a week and were then assigned a picture card test, using stills from the film. In all, 14 nonce words were used in the video: Six nouns, four verbs, and four adjectives.

The final test mainly compared the acquisition of different word classes but also investigated the question of whether the introduction of novel labels is more effective when done in a group or individually. Three nonce labels, a noun, an adjective and a verb referred to a novel object, an unfamiliar adjective and a novel action. The object *(fiffin)* was a cardboard roll holding a sock, the colour *(chartreuse)* was some sort of turquoise, and the action *(to gorple)* was throwing the object up in the air so it looped the loop.

8 This study, in turn, is based on Rice & Woodsmall (1988).

### 4.1.2 Results

The results presented here are preliminary as the experiments are still in the process of being fully evaluated. Thus, any conclusions may only be drawn with some caution.

- As for the question of sex, previous results of both L1 studies and the L2 pilot study suggest that there are no differences. However, these experiments indicate that the boys may be better at fast mapping than the girls. This may be due to the fact that the only male preschool teacher in Altenholz happened to be English-speaking and presented a real authority (in the positive sense), especially for the boys, so that they may be more motivated than the girls to pick up new English words.
- Age affects fast mapping success in the tasks involving more than one novel label.
- Word class is an influential factor: In general, nouns are better memorized than verbs, and verbs, in turn, are more successfully memorized than adjectives. This seems to support the view of the primacy of nouns (Gentner 1981,1982,1999, Gentner & Boroditsky 2001, see also Viberg, this volume).
- The ability of fast mapping is not affected by different introductory contexts. Even if the children are not given the opportunity to negotiate meaning, i.e., ask questions about the meaning of new words (as in the video experiment), they are able to infer the target-like meaning and memorize it.
- The attention level and concentration involved in a particular task are important as is suggested by the game involving the racing car. None of the subjects memorized the respective word, *veb*, for 'tyre'.
- Children receive better scores when novel labels are introduced to them individually rather than in a group situation.
- Not surprisingly, the frequency with which a new label is introduced plays a role in fast mapping as the results of the test involving two animal names show. 85% of the children memorized a novel label that they had heard twice, while 64% of the children pointed to the item that was labelled once.
- Comprehension is by far more successful than production. In the experiment based on Carey & Bartlett (1978), none of the children was able to produce the novel label *chromium.*
- It is insignificant whether children are tested after a one-day or a one-week delay after the introduction of a novel label. Their performance is relatively stable.
- The monolingual German children perform better than the L2 English children in every task.

The tentative conclusion in Rohde & Tiefenthal (2000) is supported: Due to the fact that English is not the ambient language and German is by far dominant, fast mapping is consistently more successful in a German context as new words in German tend to be more salient than in English where the attention required to understand, e.g. instructions may be considerably higher. In general, it can be said that the L2 children are capable of fast mapping and that even in an acquisitional situation with a

somewhat reduced input (recall that there are only two L1 English speakers in the preschool), children can benefit from the ability to memorize English words after hearing them only a few times. This suggests that lexical principles are not only available in one's L1 but also in L2 acquisition. In other words, it appears that the default assumptions children and adults have about possible referents upon hearing a novel word do not have to be acquired afresh with every new language but rather are available from L1 acquisition. This hypothesis was tested in a number of experiments.

### 4.2 Lexical principles

Whereas lexical acquisition theories of the 1970s mostly dealt with the acquisition and the development of individual meanings (overview in Dromi 1987, Wode 1988/1993), the acquisition theories of the 1980s addressed the more fundamental question of how meanings are mapped onto words in the first place. Markman (1989, 1992, 1994a,b) and her collaborators (Markman & Hutchinson 1984, Markman & Wachtel 1988, Liitschwager & Markman 1994, Woodward & Markman 1997) postulated three lexical principles that especially guide early word learning: *The whole object assumption,* which holds that labels refer to objects in their entirety and not to their parts or substances; *the mutual exclusivity assumption*, claiming that children prefer only one label for one object; and *the taxonomic assumption,* suggesting that labels refer to objects of like kind. These assumptions are claimed to limit the learner's assumptions as to what extra-linguistic entity a given word refers to. The task of lexical learning is thus facilitated and the acquisition process is speeded up. The so-called Quinean paradox, according to which any new word could have a potentially infinite number of referents, is avoided (Quine 1960).

> To take a concrete example, suppose a child hears someone label a dog as *dog.* The child could think that the label refers to a specific individual (e.g., Rover), or to one of its parts (e.g., tail), or to its substance, size, shape, color, position in space, and so on. Given that it is not possible for anyone, let alone a young child, to rule out every logically possible hypothesis, how is it that children succeed in figuring out the correct meanings of terms? (Markman 1994a, p. 155)

The three assumptions mentioned constrain the children in their first guesses as what entity a new label refers to, yet at the same time, they enable the child to build up a large lexicon in a short period of time.

There has been some controversy as to the terminology, some voices claiming that principles (as in syntactic theories, for example) should work on an all-or-nothing basis (Nelson 1988, Kuczaj 1990). However, it is obvious that lexical principles have to be violated at some point, otherwise children would never be able to refer to parts or substances, form taxonomies (as *dog* and *animal* could refer to the same referent, violating mutual exclusivity), or, even worse, learn a second or third language. The term 'principle' has to be understood as "good first guesses as to what a novel word means" (Markman 1992). These first guesses can and, of course, have to be revised when the evidence invites a child to do so, e.g., when there is the adult's explicit

explanation that *a dog* is also a kind of *animal* or a kind of *pet*, the child will accept these terms as overlapping synonyms (for the more recent criticism of lexical principles, see section 4.3 below).

A wealth of L1 acquisitional studies provides evidence in favour of the availability of lexical principles (Golinkoff et al. 1992, 1994, Golinkoff, Shuff-Bailey et al. 1995, Merriman & Bowman 1989, overviews in Markman 1994b and Rohde 2001). As yet, the principles have not been studied in connection with L2 acquisition. A preliminary study of L2 production data (Rohde 2000, 2001) suggests that the three principles are at work in L2 acquisition. However, in order to test the full validity of lexical principles, it is particularly important to study experimental data for comprehension. The vitally important aspect here is to investigate how children extend an L2 label upon hearing it for the first time. To this end, a series of six experiments was carried out in the preschool in Altenholz over a period of three years (1998-2001). In the first three experiments, the taxonomic assumption was tested. In the remaining three the mutual exclusivity assumption, and especially *disambiguation*, was the centre of attention. The whole object assumption was not explicitly investigated as a) there are hardly any test designs available for L1 acquisition that could be adapted to L2 studies, and b) the experiments involving the two remaining principles test the availability of the whole object assumption implicitly, as a by-product, as it were.

### 4.2.1 The taxonomic assumption

According to the taxonomic assumption, children assume that words refer to entities of the same kind. For example, upon hearing the label *dog*, the child assumes that *dog* also refers to other dogs, i.e., to other entities that look similar. In other words, the child forms categories (that do not have to match adult categories) that are labelled. For the series of experiments testing the taxonomic assumption in L2 acquisition, the designs used by Markman & Hutchinson (1984) and Golinkoff, Shuff-Bailey et al. (1995) were modified to suit an L2 acquisition study (for the pilot study, see Rohde 1999).

*Experiment 1*
20 children (aged 3 to 6) from the preschool participated in this experiment. Test materials comprised of ten sets of four picture cards showing one target object, a taxonomic basic level associate, a thematic choice, and a distractor. The sets are given in Table 1. The main prediction was that a novel label invites the child to form a category (two objects on the same taxonomic level are believed to be referents for a novel label). When there is no label, children may prefer thematically related pairs (such as a dog and a bone rather than a dog and a different dog).

**Table 1:** The sets of picture cards used in experiment 1.

| ***standard object*** | ***taxonomic choice*** | ***thematic choice*** | ***distractor*** |
|---|---|---|---|
| car | van | traffic light | cheese |
| pair of shoes | pair of pumps | naked feet | piano |
| German shepherd | beagle | doghouse | pen |
| armchair | highchair | boy sitting | flower |
| bed | crib | boy sleeping | watch |
| birthday cake | cake | birthday present | cow |
| robin | duck | nest | envelope |
| door | swinging doors | keys | scissors |
| male footballer | female runner | football | spoon |
| boy in swimsuit | girl in dungarees | swimming-pool | barrel |

Ten children were assigned the *novel word condition*, the other ten were assigned the *no word condition*. In the novel word condition, each child was shown the target object and instructed in their L2 English as follows: "See this? This is a *sib* (or any other nonce word). Can you find another *sib* which is like this *sib?"* The taxonomic, thematic and unrelated (distractor) pictures were then placed below the target object with their order varying in order to avoid a direction bias. In this condition, 80% of the time, the taxonomic associate was chosen, whereas the thematic choice, perhaps not surprisingly, was only selected 12% of the time. In the no word condition, the instruction was the same as before with the exception of there being no label for the object: "See this? Can you find another one/thing which is the same as this one/thing?" In this condition, perhaps surprisingly, the taxonomic choice was only selected 53% of the time with the thematic associate increasing to 39%. A monolingual German comparison group of 20 children from the same preschool behaved very similarly when the experiment was carried out with German instructions and a German nonce word. The results were analyzed with a two-way ANOVA, the differences between conditions proved to be highly significant: $F(1,36) = 18.8$, $p < .001$, $\eta^2 = .34$ (for the taxonomic choices), $F(1,36) = 17.3$, $p < .001$, $\eta^2 = .33$ (for the thematic choices). There was no difference between the L2 and L1 group.

*Experiments 2 and 3*

The design used in experiments 2 and 3 was the same as in experiment 1. However, the degree of similarity between the target object and its taxonomic associates differed. In experiment 2, both taxonomic pictures (standard object and taxonomic choice) involved in every trial were not related by the same taxonomic level, the basic level as in experiment 1, but by a superordinate level. Thus, for example, a cow and a pig were related by the superordinate category *farm animal*, a bee and a beetle were both *insects*, etc. The sets of picture cards are given in Table 2:

**Table 2:** The sets of picture cards used in experiment 2.

| ***standard object*** | ***taxonomic choice*** | ***thematic choice*** | ***distractor*** |
|---|---|---|---|
| cow | pig | milk | pen |
| ring | necklace | hand | envelope |
| door | window | key | barrel |
| crib | adult bed | baby | scissors |
| bee | beetle | flower | spoon |
| hanger | hook | dress | duck |
| cup | glass | kettle | shoes |
| car | bicycle | car tyre | football |
| train | van | railway tracks | watch |
| dog | cat | doghouse | piano |

In the novel word condition, the taxonomic choice was selected 56% of the time (as opposed to 80% in experiment 1). In the no word condition, children opted for the thematic choices 74% of the time with the taxonomic choices dropping to 26%. In other words, when asked to find another object like a cow, children tended to opt for the milk rather than the pig. These results also proved to be highly significant.

The third experiment reduced the similarity between the standard object and the taxonomic choice even further. A cow was now paired with a bird as its taxonomic associate (superordinate category *animal)* and with a bottle of milk as the thematic choice, or a train was paired with a bike *(vehicle).* As hypothesized, the number of thematic responses for both the L2 and the monolingual L1 group rises in this experiment. However, even when there is hardly any or even no similarity between two objects belonging to one superordinate category, a novel label fosters the children's formation of a category, as the number of taxonomic choices reveals in the novel word condition. These results also proved to be highly significant.

All three experiments support the availability of the taxonomic assumption in L2 acquisition and also provide further evidence for this assumption in L1 acquisition. "Children are more inclined to form categories on both basic and superordinate levels upon hearing a label for the objects they are supposed to attend to" (Rohde 2000, p. 472). When no label is given, children increase their attention towards thematic relationships, i.e., to objects that are generally experienced together in the extra-linguistic world. Note that this happens despite the fact that the instructions given to the children clearly call for a taxonomic associate. It can be ruled out that this is due to the fact that the children do not understand the instructions in English as they usually insist that they do. What is more important, the results are basically the same when the instructions are in German for the monolingual German group. Thus, it can be concluded that words function as invitations to form categories (Waxman & Markow

1995) in both L1 and L2 acquisition. Language is clearly not the only means of forming categories, but it seems to facilitate the task considerably.

### 4.2.2 The mutual exclusivity assumption: disambiguation

Another series of experiments were conducted in order to test the mutual exclusivity assumption, according to which children prefer one word per object. This assumption is based on the observation that children, especially in early lexical acquisition, often deny that a dog or a cat can also be referred to as an *animal* (Markman & Wachtel 1988). One effect of the mutual exclusivity assumption is the ability of *disambiguation* (Carey & Bartlett 1978, Merriman & Bowman 1989, Merriman & Kutlesic 1993, Davidson et al. 1997). Children (and adults) are able to disambiguate a potentially ambiguous situation when they assume that an unfamiliar (or novel) word refers to an unfamiliar object. Imagine an 18-month old child playing with a toy tool set. She knows the three tools included (screwdriver, hammer, and saw). Her dad buys a new tool, a wrench, and adds it to the set. As father and child look into the jumble of tools in the box, the father says, "Daddy sees a wrench". The child triumphantly pulls out the wrench, even though she had not known the label (Mervis & Bertrand 1994, p. 1646). The child could assume that "wrench" was an alternative label for any of the familiar toys, but the evidence from the studies cited above clearly shows that this almost never happens.

The L2 experiments carried out in the preschool were based on various L1 studies. The first experiment featured real objects both familiar and unfamiliar. Children were shown two objects in each of 12 trials and asked individually to pass familiar objects (candle, sock, pen) by using the conventional labels or unfamiliar objects (a metal hinge, a guitar capodaster, an unusual napkin ring, etc.) by using nonce words. The outcome was very clear for both L1 and L2 children: Unfamiliar words refer to unfamiliar objects. The results proved to be highly significant. In a second experiment based on the design in Au & Glusman (1990), children were taught novel labels for toy animals and then asked to find other animals of the same name. Besides providing support for the taxonomic assumption, children clearly reserved only one label for one category, never accepting two new nouns for a novel object.

In the third experiment, children were given three words for only two objects present. Children saw two objects in each of three trials, one familiar, the other unfamiliar (e.g., a cup and a plastic shape). For each object pair, three labels were offered one after the other with only one label being familiar in each trial. The labels were given in a different order in each trial with the familiar label occurring first, second and third so that the children could not anticipate its occurrence. Many of the children tended to actively look for a potential third referent every time the two objects placed on the table had been identified. Thus, for example, children were given a cup and a plastic shape and first asked "show me the cup", then "show me the *meech*" (a nonce word), and finally "show me the *slone*" (a nonce word). Many of the children did not think

that the second new label was a second label for any of the two objects, but looked around to find a possible referent. They then picked an item from a pile of objects which was apparently not intended for use in this experiment and which was only within their reach if they got up and stretched out their hands. This behaviour was provoked by the experimental design but had occurred accidentally in an earlier game when a few children showed this behaviour when nonce words were used for unfamiliar objects. The L2 children showed a significantly higher rate of disambiguation in this experiment, suggesting that disambiguation as an effect of the mutual exclusivity assumption is even stronger in L2 acquisition than in L1 acquisition. Why should this be? In Rohde (2001) it is argued that, unlike L1 acquisition, children may use lexical principles more effectively to the extent that they are employed as word learning strategies. In their L2 acquisition, the three- to six-year olds have to build up a vocabulary from scratch. As they are obviously cognitively more advanced than one-year-old L1 learners and have acquired a number of complex taxonomies, the conceptual structure of such a taxonomy does not have to be acquired again, but children can systematically work on their L2 lexicons by first concentrating on the basic level, i.e., the highest level at which an object/entitity can still be visualized as an individual (e.g., dog, cat, horse vs. pet, animal, mammal, see Taylor 1989). L2 English production data by the four Wode children, collected during their six-month stay in California in 1975, suggest that the children's noun lexicons are clearly dominated by basic level terms (Witt 1990). There are only very few subordinate or superordinate lexical items, even when the entire lexicons exceed the 1,000 word-type mark. In addition, there do not seem to be any overlapping synonyms (*large* and *big* being one conspicuous exception). This behaviour is reflected in the last disambiguation experiment discussed when the children seem to assume that every L2 nonce word is a basic level item, thus following both the taxonomic and the mutual exclusivity assumptions. The monolingual German children exhibit this behaviour as well, however, to a significantly weaker degree.

### 4.3 Lexical principles under attack

The postulation of lexical principles has recently been critized and some authors explicitly deny their existence (L. Bloom 1993, 2000, Nelson 1988, 1996, Akhtar & Tomasello 2000, Tomasello 2001). Instead, it is claimed that word learning can only be seen within a social-pragmatic approach, "[...] adopting instead an experientalist and conceptualist view of language in which linguistic symbols are used by human beings to invite others to experience situations in particular ways" (Tomasello 2001, p. 134). According to this view "language is one means by which adults exhort children to attend to certain aspects of a shared social situation" (ibd., p.135). Quine's induction problem is not a problem for the word learning child as the infinite number of hypotheses as to what a word may refer to is simply not part of the child's experience. The social-pragmatic embedding of word learning, however, cannot do the trick alone. P. Bloom (2000, 2001) therefore postulates that the child's theory of mind solves the word learning problem: In a situation where the child is confronted with one familiar

and one novel object and is asked to "point to the *fendle"* (using a nonce word), the child does not have to assume that labels are mutually exclusive but, rather, has to be able to interpret the speaker's intention. As the speaker uses an unfamiliar word, he/she must be referring to the unfamiliar object, because otherwise he/she would have used the familiar label that (s)he knows the listening child is familiar with (P. Bloom 2000, p. 68). According to yet another interpretation of this particular context, the child attends to what is *relevant* to the situation, applying Sperber & Wilson's (1995) relevance theory to the word learning problem (L. Bloom 1993, 2000, Nelson 1996).

It is certainly true that lexical principles cannot work in a vacuum. Language learning is undeniably a socio-cultural process, and, obviously, the child's language acquisition in general is strongly influenced by the ability to interpret other people's (communicative) intentions. Otherwise, children would never be able to understand irony or the intention behind utterances such as "the door is open" or "it's cold in here". However, neither a socio-pragmatic approach, nor the child's theory of mind nor relevance theory are currently able to explain the specific learning behaviour predicted by lexical principles. According to P. Bloom (2000), in the above disambiguation example ("show me the *fendle*"), the child is able to read the speaker's intention – but why does the speaker act in line with the mutual exclusivity principle? The problem here is simply shifted from the learner to the adult speaker. The theory of mind approach is not able to explain why the general preference for one word per object is not restricted to single languages. Thus, the real question of why speakers of all different languages should have the same intentions in specific communicative situations is simply ignored. A similar "problem shift" is displayed by accounting for the child's word learning behaviour by calling upon the services of relevance theory. Who defines what is relevant in a particular situation? (Clark 1987). If any object or any of its parts can be theoretically relevant in a particular situation, the concept of relevance is reduced to an arbitrary concept. And there is yet another question which remains: Can single parts of a coherent concrete object in the sense of Spelke (1990) be relevant to a one-year old? In the early stages of lexical acquisition, children attend to whole objects and tend to acquire basic level labels for them. There is a conspicuous lack of labels for single object parts in early lexical acquisition. Even if a dog is wagging its tail and an adult points to the tail, labelling it, it is questionable if the child accepts this as a label for the tail. The child will rather take it to be a label for the entire object/entity (Markman 1989, 1992, 1994a,b).

Lexical principles have also been criticized on the grounds that they only bear on object labels and not on lexical words in general, thus representing an unlikely word learning mechanism that is specialized in one single-word category. However, Golinkoff, Hirsh-Pasek et al. (1995) modify their 2-tier model to also accommodate verbs (see also Clark 1993), and Rohde (2001) shows that the whole object assumption may also apply to dimensional adjectives, drawing on Bierwisch's (1967) measures of dimensional complexity. Thus, the lexical principle approach can theoretically be extended to all lexical word classes.

There has also been a heated debate concerning the claim that lexical principles are innate (Nelson 1988, Kuczaj 1990, Markman 1992, MacWhinney, this volume). Suffice it to say that this question is irrelevant for the current discussion. Markman (1994b) cites a large body of evidence claiming that the principles are at work at the time of the infamous word spurt (Goldfield & Reznick 1990, 1996, P. Bloom 2000). There is hardly any evidence, however, that they are available during the first approximately 50 words (but see Liittschwager & Markman 1994). Anyway, Golinkoff et al. (1994) and Golinkoff, Hirsh-Pasek et al. (1995) have claimed that principles develop in the course of two distinguishable phases (their 2-tier model). In Rohde (2001) it is argued that lexical principles evolve from more general experiences in the cognitive development of the child. The preference for whole objects can be related to the child's visual development (the infant perceives movement as the manipulation of bounded and coherent entitites, see, e.g. Spelke 1990 and Carey 1994). The taxonomic assumption is based on the (presumably innate) ability to classify entities as like or unlike (e.g., early speech perception). The mutual exclusivity assumption may, amongst other things, derive from the child's experience that no two objects can simultaneously occupy the same space and that each object/entity has only one identity (see Markman 1992). According to this view, lexical principles are a direct continuation of early object experience into linguistic knowledge. For the time being, there does not seem to be an alternative view that is able to account so specifically for the large body of experimental evidence available. Conversely, it has been recognized by the proponents of lexical principles that socio-pragmatic aspects must not be ignored. Woodward (2000a, p. 81f., 2000b, p. 174) sums up the controversy by stating:

> There is no silver bullet for word learning. No single factor can account for the word-learning success of young children. It is much more likely that each act of learning reflects the interaction of multiple constraints.

## 5. Conclusions

This paper reports on research on possible differences between L1 and L2 lexical learning by focussing on the ability of fast mapping and the availability of lexical principles, two of the principal factors presumably underlying the human word-learning faculty. The results of numerous experiments suggest that there is no fundamental difference between the two acquisitional types with regard to lexical acquisition. In the fast mapping experiments, it becomes obvious that novel L2 lexemes are less well retained after only a few exposures than novel L1 items. However, the important point is that children are generally able to memorize L2 words that they are introduced to, be it one day or one week previously. As for lexical principles, the results clearly show that the interpretation of novel nouns is guided by both the taxonomic and the mutual exclusivity assumptions in both acquisitional types. One experiment on disambiguation (an effect of mutual exclusivity) even indicates that the L2 children's tendency to follow this principle is stronger than in L1 acquisition.

In Wode et al. (1992) it was suggested that both L1 and L2 acquisition underly the same word-learning faculty. In addition, it was assumed somewhat simplistically that "L2 children and adults are cognitively more mature than L1 children at the onset of speech." This alleged maturity, however, was not specified. The research reported on in this paper possibly suggests that at least one aspect of this maturity lies in the degree to which L2 children (and adults for that matter) can make use of the lexical principles as learning strategies. The children tested have experienced via their L1 acquisition that lexical principles can and even have to be violated when the context requires it, e.g., when a child is explicitly told that a flower is a type of plant (mutual exclusivity is overriden) or when (s)he is told that a specific part of the dog is called "tail" (the whole object assumption is overridden). In L2 acquisition, the principles can be employed as strategies, so that at first, almost exclusively, basic level nouns are acquired and superordinate labels are avoided – as L2 production data from the Kiel Corpus indicates. This may suggest a rather one-dimensional L2 lexicon. Yet, these basic level terms ascertain that the developing L2 lexicon covers a maximum of individual entities as the child, by generally neglecting more abstract superordinate labels, is able to refer to a maximum of entities on the highest level on which an individual entity can be linguistically encoded. This is not to say that every L2 learner behaves like this in lexical learning. L2 learners could make do with the superordinate label "animal" and refer to dogs, cats, horses, fish, etc. by just using this term and simply not retaining basic level labels, and, nevertheless, be understood. We still do not know to what extent both quality and quantity of input as well as socio-cultural factors may affect different routes in lexical acquisition, but even this latter case suggests a learning strategy that can be attributed to a specific "exploitation" of the taxonomic assumption in the sense that the learner focusses on one level of lexical organization.

Ursula Pieper (this volume) claims that "everything is different between L1 and L2 acquisition". With regard to lexical acquisition, this is certainly true as for the baby acquiring his/her L1 and getting to know the objects in the world is one dovetailing process. The L2 learner, on the other hand, already has a lexicon under his/her belt which may influence every acquaintance with a new L2 word in a variety of unpredictable ways. On the other hand, the human word-learning faculty put to work in L1 and L2 acquisition seems to be the same as is reflected by the children's fast mapping behaviour and the availability of lexical principles. The results of the experiments show that, once children have been acquiring their L1 for a few years, the ability to pick up new words and map them to extra-linguistic entities in a target-like manner is also used for L2 acquisition and possibly every additional language being learnt.

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