

Language Learning—Explicit or Implicit ?

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要 旨

レーバーの暗黙の学習とアンダーソンの明白の学習を比較した。一般的な意見に反して、学習の方法は学習の場の違いによって表現されることがわかった。最後にこれら2種類の語学学習の具体的な方法と特別な学習の場を選択するためのガイドラインについて述べた。

Abstract

Reber's theory of implicit learning and Anderson's theory of explicit learning are first described and compared. Rather than being in opposition as is generally believed, the methods are found to describe different learning situations. Finally, the application of these two methods to language learning is discussed and guidelines are developed for deciding which method to choose in a specific teaching situation.

Introduction

We all know the story. Over the last 50 years there have been continuous changes in the TEFL/ TESL theoretical base. In the 1940s we went from grammar translation with its stress on grammar rules to the audio-lingual approach which tried to prevent the students from consciously thinking about rules. The 1960s saw the Cognitive Code method with its conscious search for rules. This was followed by the communicative approaches of the 1970s which exiled both rules and the search for them. Now in the 1990s, if the presentations being given at conferences and the conversations on the Internet are any indication, we seem to be witnessing a swing of the theoretical pendulum back toward the teaching of explicit rules of grammar. See Brown (1987) and Hadley (1993) for detailed discussions.

What is going on? Which method is 'right'? Are all methods suitable? Is any method? In spite of what theory tells us to do, many teachers follow their intuitions, using methods that "work" for them and ignoring what theoreticians are trying to tell them. This paper attempts to bring at least some of the theory in line with what at least some teachers have been doing with great success.

In the remainder of this paper we will first consider two seemingly opposing theories of learning that have been developed by cognitive psychologists. We will first consider Anderson's ACT-R, which employs a form of explicit learning. We will then consider implicit learning, primarily concentrating on research reported by Reber. While neither of these is specifically a theory of language learning, they represent a theoretical basis for the kinds of language teaching that we find at opposite ends of the pedagogical spectrum. We will find that the two theories are not contradictory, but apply to different domains. Finally we will consider how this new theoretical understanding can be used by the teacher or curriculum planner to optimize the division of labor between implicit and explicit

components in methods and materials.

Explicit Learning

ACT-R, developed by Anderson (1993, 1983) is probably the most complete and best-accepted description of an explicit learning procedure. Applying ACT-R to language learning is relatively straightforward and intuitive. The student first consciously learns declarative knowledge about the language, in other words, the rules (grammar in the case of language learning) and pertinent concepts (including vocabulary for language learning). When the rules are difficult to express in words, they may be illustrated or demonstrated with or without further explanation. In the classroom the rules are often learned one at a time and then practiced until they become what is termed procedural knowledge. Procedural knowledge, to oversimplify, can be described as declarative knowledge that has become automated. Such practice requires conscious effort, possibly a substantial amount, on the part of the student. Exemplars are often given but their purpose is to insure full comprehension of the rules. Three conditions are generally met during the process of learning: [1] the student is generally aware that there is a rule, [2] the student usually knows he or she knows the rule, and [3] the student can potentially transmit the rule to another person. Later, after the rule has become procedural knowledge, the student may possibly lose access to the declarative knowledge and no longer be able to meet the three conditions.

Although not specifically a part of ACT-R, if the target skill is complex, the curriculum designer will determine the component skills, their interactions, and the optimal sequence for teaching /learning. This sequence is then used to teach the component skills and their interactions, using the method described above. The curriculum can be represented by a pyramid with a broad foundation of basic skills at the bottom and subsequent layers of combinations and combinations

of combinations. The student usually learns the skills one at a time in a bottom-up order, learning the basic skills first and their combinations later.

Experiments and applications in a variety of fields (languages, mathematics, computer programming, for example) have achieved positive results (Anderson, et al, in press). Preliminary results from research in progress (DeKeyser, 1996) tentatively demonstrate that Andersonian automatization can be carried out in the language classroom.

Reber's Implicit Learning

The study of implicit learning has mainly taken place within the field of cognitive psychology, rather than in pure or applied linguistics. Reber (1993) and Lewicki (1986), two of the primary workers in this field, each define implicit learning as what takes place when we learn a natural language, particularly our first, or when we acquire the skills of socialization. They also say that implicit learning is the same as the 'tacit' learning (Polanyi, 1962, 1969). This is the kind of learning that American college students call "osmosis." They simply immerse themselves in the material, usually in an uncontrolled manner, and allowed the understanding to emerge magically over time.

Implicit learning is characterized by its non-conscious processes. The students pay attention to a set of exemplars as they are presented, nothing more is required. This is in contrast to the explicit methods where student attention is directed to the rules. Here the students may not even be told that the data is rule governed. In the case of language learning, the students attention is directed to the meaning of the exemplars, rather than the grammar. Such attention to the exemplars is most effectively developed as a result of the student's interest in the subject matter. In experimental situations this attention is often obtained by telling the subjects that they will be tested on whether or not items from a set of test

sentences appeared in the set of exemplars. The testees typically know that they have learned something but they are not able to say what it was or can discuss it only in the most general way. They are frequently not even aware of the abstract rule-governed nature of the phenomena in question. This is also in contrast to explicit learning where the students know that the phenomena are rule governed and can usually state the rule. When told that the exemplars are rule governed and asked to state the rule, students who are learning with implicit methods will give highly individualistic rules that are most often wrong but in any case seldom reflect the rules used to generate the exemplars (Reber, 1993).

The result of implicit learning is often the acquisition of abstract 'rules' for extremely complex procedures with numerous interrelationships. These rules are frequently probabilistic in nature. Another characteristic is that the set of exemplars seen by the student could have been generated from a large variety of different rules, so it is not possible to use the data set to determine the rules that generated it. The outcome of this is that different learners can generate different rules from the same data. Some detailed questions to a group of native speakers will soon verify that this is true for natural languages, although there will be many surface similarities and a tendency to converge to a set of somewhat similar rules, or we could not communicate. Another indication that native speakers tend to have different rules is the frequent discussion on the JALTCALL or TESL-L Internet mailing lists about the "correctness" or "meanings" of certain sentences. Almost every person who responds has a different understanding of the nature of the phenomenon and the rules involved. And this is from a group of people who are supposed to be extremely knowledgeable about language and its uses.

The large body of experimentation on which Reber (1993) reports shows that the most effective

implicit learning is obtained when the student *attends* to a fairly large set of structured exemplars without being told the true goals and without being encouraged to find rules. The key here is the word "attends" which is meant to imply that the student is consciously aware of the exemplars, but not the rules - a fact that was demonstrated during the experiments. Maximal learning takes place when "there is some direction provided at the outset about the underlying nature of the environment" (Reber, 1993, pg. 159) without actually specifying the rules. The student merely tries to remember the information that is being presented. We should note here that the exemplars Reber used in these experiments are meaningless rule-governed strings of letters which form models of sentences, so the question of understanding does not apply.

The Conflict

We are now left with two independent learning processes. Anderson and Reber with their respective colleagues have published large bodies of experimental evidence supporting their arguments but not necessarily contradicting the opposing theory. Also each of us is probably able to draw on a fairly large collection of personal anecdotal evidence in support of each of these processes. Most teachers seem to prefer one approach or the other, but can bring forth anecdotes supporting the other process.

Reber (1993) was concerned about this apparent conflict so he conducted a series of experiments to investigate the implicit-explicit learning boundary. He used his usual exemplars, sets of letter strings of varying length generated from Markovian artificial grammars(1) with five to ten nodes. He says the letters represent words and the permissible patterns are expressions of the grammar. In other words, they are sentences from an abstracted form of language. In this study, the subjects were shown a set of 20 exemplars twice and asked to memorize them in preparation for a later test of recognition. The experiment was presented to the students as a test of memory. The viewing time for one exemplar was typically five seconds, so the whole learning process took about five minutes. The subject was then shown a new set of 50 items one at a time and asked to judge each one's "grammaticality," that is, whether or not it could be an acceptable addition to the original set of exemplars (to which the subject no longer has access). Half of the stimuli were generated by the original rule and half could not be generated by such rules. The subjects were given no feedback on the correctness of their answers.

Reber (1993, pg. 59) found that subjects in this kind of experiment are able to judge grammaticality correctly 73% of the time in the original task. Next, Reber gave different groups of testees seven minutes of explicit instructions (a diagram showing

Table 1 . Comparison of the results from Reber, 1993, page59.

| Condition | Percentage correct on test |
|--|----------------------------|
| Random guessing | 50% |
| Explicit training after presentation of exemplars | 57% |
| Explicit training during the presentation of exemplars | 58% |
| Explicit training before the presentation of exemplars | 67% |
| Implicit presentations of the exemplars only | 73% |

the grammar and instruction on how to use it) before, during or after the training. The results were 67% correct when explanation was given before the training, 58% correct during the training, and 57% after the training. All the results were statistically significant, so the differences are unlikely to have occurred by chance.

It is interesting to note that giving explicit training first was better than giving them during or after implicit training, but that this was not as effective as the implicit training alone. In other words the rules tended to inhibit learning. Reber predicts that more complex real world phenomena would show even more of a difference.

Since a Markovian artificial grammar is relatively simple in the mathematical sense, it might be possible to analyze the grammar into individual tasks based on the outputs of individual nodes. Then the students could be taught each of these sub-rules and then they could practice each rule until it was automated. Then they could practice with combinations until these were automated. However, considering that it took seven minutes just to explain the simple grammar, this would take many, many times the five minutes that the implicit learning required but it could be done in theory.

Conflict Resolution

With the above information in hand it is clear that theories of explicit and implicit learning are not contradictory, but rather apply to different learning situations.

Based on the above, explication of rules will be preferable for material that is new and can be described by psychologically simple rules which are easily teachable, rememberable and generalizable. In order to use this generalization, we need to make the last three terms more concrete: [1] *teachable* means that the students can understand and apply the rule with the knowledge and skills

which are currently available to them; [2] *rememberable* means that the students must be able to remember the rule; [3] *generalizable* means that the rule will apply in other contexts, not just the specific contexts of the exemplars.

For psychologically complex knowledge or for rule-governed systems for which we can not specify the rules, we should use implicit learning methods for optimal results. An easy way to conceptualize 'psychological complexity' is to count the number of variables used by the rule or rules that apply. If that number is more than about five, the phenomenon is complex and the data will begin overloading the consciousness, leading to faulty results. To illustrate what can happen, we might consider something that many language learners have experienced. The student is struggling with the pronunciation of the new language. To do this the student must monitor and control such things as position of the lips and tongue, breathing force, rate and depth, and energy applied both to the muscles in the mouth and throat. For many, this is already overwhelming, but students can usually do it successfully. Now, the teacher tells the student to pay attention to whether the nouns are masculine or feminine and to consciously use the correct forms of the associated words. At this point even the best students lose the ability to correctly make the sounds or get the forms correct. Their conscious has become overloaded and they start losing track of things. Their performance begins to vary wildly as their attention wanders from place to place. This overloading is due to psychological complexity.

Explicit and Implicit Methods in Language Teaching

For the teacher or the curriculum designer, the choice between explicit and implicit methods is now relatively straightforward. We first gather some basic data. We must look carefully at each of the teaching objectives for the course and decide whether they are best represented by 'psychologically simple' explicit knowledge, by 'psychologically

complex' implicit knowledge, or some portion of each. We must also determine whether or not the students have previously been exposed to explicit training in the 'rules.'

With this information in hand and the knowledge of the characteristics of implicit and explicit learning as discussed above, we can now decide how to teach the material to the students. If the goal is best represented as explicit knowledge, we should use explicit methods when there is no previous explicit study of the rules. When the students have been explicitly exposed to rules, implicit methods, possibly preceded by a review of the rules to ensure that the students have the correct rules, would be appropriate. If the goal is implicit knowledge, we should use implicit methods whether or not there has been exposure. If both kinds of knowledge are present in the class goals, implicit and explicit portions should be isolated, and then taught by the appropriate method.

Let's consider how to apply these rules of thumb to some practical examples.

1. Suppose that you are responsible for developing a course for basic students and the goal is 'English conversation', a frequently stated goal for English courses at Japanese universities. What sort of course do we design? English conversation, whatever it is, is obviously implicit. There are some known rules but mostly the rules are non-conscious and their gradual discovery is keeping an army of linguists busy. Also we know that the Japanese students will have been exposed to explicit rules and a limited number of exemplars in their high school English

classes. Therefore, we should develop a course that gives the students numerous examples of real conversations and includes activities which require the students to attend to the examples. The examples could be audio or video tapes or even written transcripts, since it has been shown that implicit knowledge transfers readily between modalities (Reber, 1993). After exposure, the students would practice by doing role plays, having structured or free small group conversations, or some other similar activity which would be chosen after consideration of the overall goals of the course.

2. Suppose you have been tasked with the development a course on writing engineering reports for upper level students at your technical university. First you would check with the engineering faculty and determine if the students had been using English engineering reports in their studies. We will assume that the faculty says that the students have probably never seen an English engineering report and have definitely never read one. This means we can assume no previous training in rules. A quick check of the literature would reveal that there are definite consistencies in the format and the language that can be verbalized as declarative knowledge. These do not seem to be psychologically complex, especially the formatting. However, the language that is used in the body of these reports is definitely implicit knowledge. Here we can use explicit methods to teach the formats and specific new language forms. Any exemplars that we use to demonstrate the rules will be imbedded in natural language which will supply the exemplars

Table 2. Decision grid comparing teaching method to goals and exposure to exemplars of goals.

| | No Previous explicit training in the rules | Previous explicit training in the rules |
|-------------------------|--|--|
| Goal=Explicit skill | Explicit methods | Revision of rules followed by Implicit methods |
| Goal=Implicit knowledge | Implicit methods | Implicit methods |

necessary to continue the implicit learning of the language in general.

3. Suppose you are going to teach a unit on reported speech to intermediate students at a Japanese EIKAIWA (conversation) school. Since the students are classified as *intermediate*, we can assume that they have been exposed to at least some exemplars and at some point they have probably been taught some rules for converting direct speech into reported speech. Also we can be sure, based on experience, that the students will be expecting to be given some more rules. We might begin by catering to this expectation. We could give the students a list of verbs that are commonly used in reporting speech. We would probably also want to give the students the patterns that occur around these verbs, for example, SAY: someone said that, TELL: someone told someone that, ASK: someone asked if ; someone asked whether. . . ., etc. We might also give the students some simple rules about time and space conversions, for example, *today* becomes *that day* and *here* becomes *there*. That would take care of the "rules" problem. Next we would expose the students to a massive collection of examples of direct speech and the reports of it. The teachers skill and knowledge will be of use in insuring that the students *pay attention* to the paired examples and that they are meaningful for the students (if anything more than pure grammar is the goal). Practice would involve exercises in converting one form to the other. The first exercise that comes to mind would be to have groups of students convert the script of a movie from direct to reported speech. The groups could then exchange the reported speech scripts and convert the reported speech back to direct speech. Finally the whole class could watch the movie and compare their versions of the direct speech to the actual script of the movie.

We must also be aware that we need to consider

implicit learning from two different logical positions. The lesson may be implicit for the learner, but for the designer it should not be. Course designers must make the material excruciatingly explicit for themselves, so that it can be delightfully implicit for the learner. The details of the process are extremely complex and the analysis is beyond the goals of this paper. We can say, however, that good implicit is far more difficult to do than good explicit.

The course designer should be aware of another point about rules. In language there are actually three grammars, not one, that must be considered. They are [1] the 'wet' neural grammar that is in the head of the speaker, [2] the equally 'wet' neural grammar that is in the head of the listener, [3] and finally there is the abstract, theoretical grammar that can be extracted from the language sample that passes between the two. All three can be, and usually are, different. Linguists spend their time with [3], but we must remember that as teachers we are installing [1] and [2] and that they probably do not contain explicit representations of rules. Therefore, we must design our materials with the implications of grammars [1] and [2] in mind.

Conclusion

Implicit and explicit language learning both have a place in the curriculum content. Implicit learning is required for acquiring most of the target language itself and the complex social skills that go with the language. However, many of the things that we do with language (report writing, learning things such as mathematics or history, structuring a speech or, etc.) can be best taught through the explicit teaching of rules followed by extensive practice in applying them.

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END NOTE :

(1) A Markovian Grammar is an artificial grammar consisting of a network of possibilities where the nodes represent words and the paths represent their allowable combinations. Specific instances are generated by a discrete stochastic process (as in a random walk through the network) in which the future states of the system depend only on the current state and not on the path by which the current state was achieved. All of the grammars used in Reber's studies are derived from Miller and Stein (Reber, pg 28).

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