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1. Introduction

Within the last ten years, the accepted teaching paradigm of presentation - practice - production has been increasingly questioned (Harmer, 1996). Several alternatives to this paradigm have been suggested. For example, Lewis (1993) suggests observation - hypothesis formation - experimentation as an alternative paradigm, McCarthy and Carter (1995) suggest illustration - interaction - induction, and Scrivener (1994) suggests authentic use - restricted use - clarification and focus. A shared characteristic of these suggestions is that they emphasise induction in the learning process, whereas presentation - practice - production stresses deduction. Despite much research into the effectiveness of induction versus deduction, it is still unclear whether learners can induce valid rules or patterns from language data. This paper aims to investigate this point, focusing especially on the effects of the language points themselves on the learners' ability to induce valid patterns.

A second aim of this paper is to see whether learners can apply the patterns they induce in self-correction of errors in writing. Most work on self-correction (e.g. Gower et al., 1995; Tudor, 1996) advocates learners trying to correct errors after the teacher has marked the written work using a coding scheme indicating the nature and location of the errors. In this paper, however, only the location of the error is given, and learners are expected to self-discover the nature of the error while inducing patterns from a self-

selected corpus. In this way, the process of applying inductions in self-correction is investigated.

1.1 The nature and benefits of induction

There appear to be two sets of beliefs about the nature of induction. On the one hand, Cross (1991) argues that induction is a process requiring little effort on the part of learners, since "the rules will become evident if learners are given enough appropriate examples" (p. 28). On the other hand, many definitions of induction contain words implying an active role for the learners, such as "discover" (Stern, 1992, p. 150), "infer" (Carroll, 1981, p. 105), and "consciously perceive" (Shaffer, 1989, p. 395).

Although Cross' belief about the nature of induction is perhaps supported by the fact that even unmotivated learners can learn inductively, induction in his terms is a private process not easily accessible and is not the kind of induction implied by the paradigms discussed above. Given the growth in importance of the inductively-oriented paradigms, the second kind of induction is probably of more relevance to most teachers. In this paper, then, I will investigate induction as a process requiring learners to play an active and conscious role.

This kind of induction is a two-stage process. Firstly, learners focus their attention on examples illustrating the target language point, and secondly, from these examples they consciously generate rules or patterns (Shaffer, 1989). For the first of these two stages, to aid in the generation of rules, examples should be carefully selected to draw learners' attention to the language focus, a vital prerequisite for learning (Schmidt, 1990; van Lier,

1996), and to highlight the rule to be generated (Stern, 1992). Indeed, James (1994) goes so far as to argue that the selection and presentation of suitable examples is the teacher's main task. In the second stage, after generating the rule, learners should verbalise it, since explicitly stating the rule in itself can bring about further linguistic insights (Larsen-Freeman, 1991).

This two-stage induction process has a long if controversial history in language teaching. Stern (1992) cites Sweet (1899) as arguing for a method of inductive grammar, and the audiolingual method prevalent in the 1960s and 1970s was closely associated with inductive teaching. This latter focus on inductive teaching spawned a large volume of research comparing induction represented by audiolingualism with deduction represented by grammar-translation (e.g. Fischer, 1979; Seliger, 1975). Such comparisons are, however, probably not relevant to induction as envisaged in the recently suggested paradigms, and such large-scale methodological comparisons are so fraught with problems as to be unreliable and perhaps invalid (see Woods, 1996). More recently, Nagata (1997) conducted a more specific comparison of induction and deduction focusing on the effects of two different kinds of feedback on writing. The results pointed to the benefits of deductive feedback, but the process of induction he used was incomplete as students were not required to explicitly state any rules generated.

Despite a large amount of research, then, the comparative benefits of induction and deduction are still not clear. Nevertheless, arguments favouring induction appear in the literature. Without actually citing any research, Brown (1994a, p. 92) states that "most of the evidence in communicative second language learning points to the superiority of an

inductive approach". Again without citing any research, in another text he argues that an inductive approach is preferable because

> "it is more in keeping with natural language acquisition … it conforms more easily to the concept of interlanguage development … it allows students to get a communicative 'feel' for some aspects of language before getting possibly overwhelmed by grammatical explanations … it builds more intrinsic motivation."
>
> (Brown, 1994b, p. 351)

Although these points are debatable, they highlight a general feeling about the importance of induction in language teaching.

1.2 Concordances and induction

In addition to the alternative teaching paradigms, a further impetus behind the growing interest in induction is the increasing use of corpora and concordancing in language teaching (Coniam, 1997). Concordances can highlight grammatical patterns, collocations and pragmatic aspects of lexical items (Fox, 1998), but these need to be induced from the corpus. The most common procedure for using concordances in language teaching, therefore, is to present a carefully selected collection of instances of an item to the learners and ask them to induce patterns from it. In this way, concordances are linked to discovery learning (Robinson, 1994) and raising language awareness (Wichmann, 1995; Willis, 1998).

This is all well and good, but in an age when learner centredness and learner autonomy are also emphasised in language teaching (Dickinson, 1987; Tudor, 1996), the reliance on the teacher to provide the carefully selected

concordance could be viewed as restricting learners' options. If, on the other hand, learners are encouraged to find their own instances of items, there is no guarantee that these instances will facilitate induction. For example, with extensive reading (see Day and Bamford, 1998), teachers might hope that learners could induce some useful patterns from their reading, but since teachers cannot select the lexical items learners encounter in reading, the instances of the lexical items may form a hotchpotch from which no patterns can be induced.

Given that learners may find themselves in situations where they need to induce patterns from a self-selected collection of instances, is it reasonable for teachers to expect them to be able to induce valid patterns? This is one question which this paper attempts to answer.

1.3 Self-correction

Self-correction can be viewed as a global goal of language learning, since in the long run learners should "be able to make self-initiated self-repairs" (Allwright and Bailey, 1991, p. 107). Reaching this goal, however, is problematic. If learners can identify their own errors and self-correct them, we might wonder why they made the error in the first place, especially for writing where learners can devote time to accuracy. Most approaches to self-correction, therefore, do not leave learners totally to their own devices, but require teachers to provide some support. Usually, this support involves detecting and pointing out the errors, while leaving the actual correction to the learners (Makino, 1993). Learners may be informed of the commission, location and/or nature of their errors, and then be expected to correct the errors themselves, perhaps with further support from resources such as

reference books (Carver and Dickinson, 1982; Scrivener, 1994). One potential benefit of approaches such as this is that they can help learners self-discover and learn language while self-discovering (Makino, 1993). While self-correction is a potentially very beneficial goal in language learning, how learners make self-corrections is unclear. If learners induce rules or patterns from language data, do they try to use the induced patterns in their attempts at self-correction, or do they not see the link between inducing patterns and applying patterns? This paper therefore examines learners' ability to apply induced patterns in self-correction.

2. Research methodology

2.1 Subjects

The subjects for this study were 25 postgraduate students of science and engineering taking an English language support course at King Mongkut's University of Technology Thonburi, a technological university in Thailand. They are of lower intermediate to intermediate level.

2.2 Procedures

As part of their course, students were required to write a report. One page of this for each student was handed in to the teacher as a first draft. The teacher coded for common errors on this draft for later self-correction by the students, and also indicated two content lexical items which were misused. These lexical items were chosen based on the facts that they had been misused, and that they could be used as a search item on the Internet.

For the two lexical items indicated, students were asked to search for instances of use of the items on the Internet using FAST Search

(http://www.alltheweb.com), which searches within pages rather than relying on meta-tags. Having found ten instances, the students were asked to make a concordance of their instances from which they were then required to induce patterns. They were given an example concordance with induced patterns to follow as a model, but no other training in induction was provided. The students were then asked to correct the sentences containing the lexical items in their draft based on the patterns they had induced. Only three of the fifty lexical items indicated (two each for 25 students) were common to more than one student. Having completed the concordance and the correction, students were asked to hand in one of their two concordances. Two of these were considered inappropriate for further analysis since the words selected in the concordance did not match the words misused in the students' writing. The data used in this study, then, consists of 23 concordances with induced rules and corrections. A list of the lexical items in these 23 concordances is given in the appendix.

The procedures, therefore, aim to provide a method for self-correction of writing based on induction from concordances self-selected from the corpus of the Internet. A prerequisite for self-correction, however, is induction of valid patterns from the concordance.

2.3 Analysis

To see whether the patterns students induce from the self-selected concordances are valid and useful, several different approaches were used. Firstly, the patterns induced were checked to see if they matched the concordances. Secondly, they were also checked against the COBUILD dictionary (Sinclair, 1995) and Quirk et al. (1985) where appropriate to see

whether they matched patterns generated from more extensive data. Thirdly, the students' attempts to correct their own language were analysed to see whether they matched the patterns induced. Finally, the attempted corrections were rated as correct or incorrect.

3. Results

3.1 Samples of student work

To provide concrete examples of the students' products, the following are two samples of student work. The first is an example where a student induced a correct rule and used it to effectively correct the error he had previously made.

Example 1:

Educational Assistant is an educational tool	capable	of increasing a student's attention, comprehension
Actions MooWP robots (and puppets) are	capable	of giving multi-line responses, and these
concept is one of a vehicle	capable	of traversing an antipersonnel minefield carrying
Vehicle) project involves building a robot	capable	of finding and extinguishing a fire
autonomous mobile robot navigation prototype system	capable	of performing office delivery tasks in
and built an RC servo "pup"	capable	of sitting, standing, walking and barking.
created a robot capable of … well,	capable	of navigating a maze.
A robot	capable	of juggling 3 balls was built
an autonomous mobile robot that is	capable	of competent, safe behavior.
Somehow, the Shadow is	capable	of generating quasi-real projections of itself.

Rules of capable:

Capable is used between verb to be and of.

Capable is always followed by verb ing.

Work to be corrected:

"It is *capable* taps all kinds of parts stamped and bar headed and die cast nuts, flange nuts, wing nuts 12 pt."

Correction:

"It is *capable* of tapping all kinds parts stamped and bar headed and die cast nuts, flange nuts, wing nuts 12 pt."

The second example shows an incorrect induction from the concordance, and an incorrect attempt at correcting the original error.

Example 2:

For the body, the best scheme is the	following	linear organization.
	Following	ISESS '97 SESC determined the second survey was
based upon these findings to SESC	following	this second workshop.
In the	following	we have summarized the major ideas
to be a candidate for the	following	job position, you must fill
TOP of text, page 2 and	following	pages, aligned to line
Please answer the	following	questions
obstacle avoidance and corridor	following	while a High Level
a control for mobile robots, including the	following	procedures: representation of
The	following	deals with methods for improvement of

Rule for following:

Following is used at start of sentences.

Following is expanded noun words.

Work to be corrected:

"*Following*, in this section we will explain some detail about GR101 ..."

Following is followed by 'comma'.

Correction:

"*Following* we will explain some detail about GR101 ..."

3.2 Ability to induce patterns from the concordances

From the two examples above, we can see that the rule induced in example 1 (*capable + of + verb -ing*) matches all of the instances of use given in the ten concordance lines. In example 2, on the other hand, the rule induced (*following* is used at the start of sentences) matches only 1 of the 10 instances (ignoring the second incomprehensible rule). The extent to which the rules induced validly describe the instances in the concordance is taken as a measure of student's ability to induce valid patterns. In the 23 concordances produced by the students, the number of instances correctly described by the students' induced patterns was counted for each concordance. Numbers range from 1 to the maximum of 10 with a mean of 7.78 and a standard deviation of 2.92.

3.3 The patterns induced and patterns in reference books

In addition to checking whether the patterns induced match the concordances, the patterns were also compared against the generally accepted patterns presented in the COBUILD English dictionary (Sinclair, 1995) and in Quirk et al. (1985) where appropriate. For example 1 above, the COBUILD dictionary gives the pattern *v-link ADJ of -ing/n* for *capable*, Quirk et al. (1985) also gives *capable of* complemented by an *-ing* participle clause, and the student's induced pattern also highlights the need for *of* and an *-ing* participle after *capable*. So the student's induction matches the generally accepted pattern. For example 2, however, neither the COBUILD

dictionary nor Quirk et al. (1985) mention *following* occurring at the start of sentences. In this example, then, the pattern induced does not match the patterns found in the reference books. In 5 cases, the patterns induced matched the patterns in the reference books, but other patterns not found in the reference books were also induced. Nevertheless, these cases were classified as matches between the patterns induced and the generally accepted patterns. From the 23 concordances, in 16 cases the patterns induced matched the patterns in the reference books, and in 7 cases they did not match.

3.4 Ability to apply the patterns

Having induced patterns from their concordances, students were then expected to use these patterns to correct the errors they had made in their writing. In example 1, the correction made follows the pattern induced, since the student uses the induced pattern of *capable of -ing* in making the correction. In example 2, the incorrect sentence already follows the pattern induced from the concordance (*following* is used at the start of the incorrect sentence), and this aspect of the incorrect sentence was not changed. The attempted correction therefore again follows the induced pattern. Following the induced pattern in making the correction is termed ability to apply the patterns, and for 20 of the lexical items, students exhibited this ability. For the other 3 lexical items, the attempted corrections did not follow the patterns induced.

3.5 Self-correction

The final stage of the procedures was for students to correct the errors they had made in their writing. In 16 cases including example 1, students were

able to make a valid correction of their error. However, in 5 cases including example 2, the attempted correction was itself incorrect. In the remaining 2 cases, the students corrected their previous error, but in doing so made further related errors. These latter 2 cases were, nevertheless, counted as corrections, giving a total of 18 valid self-corrections.

4. The effects of lexical items on induction and self-correction

It is posited that certain characteristics of the lexical items focused on may influence the students' ability to induce patterns and to self-correct. The characteristics investigated here are the part of speech of the lexical item, the number of parts of speech the lexical item can have, the number of patterns of usage generally exhibited by the lexical item, and the number of meanings of the lexical item. For the last three characteristics, information was obtained from the COBUILD English dictionary (Sinclair, 1985).

4.1 Effects of part of speech

The part of speech of the lexical item in the incorrect sentences of the students' writing was identified where possible, giving 8 adjectives, 11 verbs and 3 nouns. For the remaining lexical item (*following* in example 2 above), the part of speech is unclear so it is not included in the analysis in this section. For the other 22 items, the students' ability to induce valid patterns was investigated for the three parts of speech by calculating the average number of instances in the concordances which were described by the patterns induced. The students' ability to self-correct was investigated for the three parts of speech by calculating the percentage of correct attempted corrections for each part of speech. The figures are given in Table 1.

Table 1

Effects of part of speech on induction and self-correction

	Average no. of instances described by patterns (N = 10)	% of correct attempted corrections
Adjective	9.38	81
Verb	7.55	73
Noun	6.67	50

Although the numbers involved are small, they do suggest that adjectives are easier than verbs, which in turn are easier than nouns, to induce patterns and to self-correct.

4.2 Effects of number of parts of speech

The second characteristic of lexical items investigated was the number of parts of speech. For example, according to the COBUILD dictionary *capable* can only be an adjective and so has only one possible part of speech. *Following*, on the other hand, can be a preposition, adjective, pronoun or noun, and so has four possible parts of speech. The relationship between the number of parts of speech of each lexical item and students' ability to induce valid patterns and to self-correct for that lexical item was investigated. The number of parts of speech was negatively correlated with the ability to induce valid patterns (using the correlation coefficient, r = -0.36), with the ability to apply patterns (using point biserial correlation, r_{pbi} = -0.22), and with the ability to self-correct (r_{pbi} = -0.19). However, none of these correlations was significant, suggesting that the number of parts of speech of a lexical item does not influence induction and self-correction.

4.3 Effects of number of patterns of usage

For the number of patterns of usage of the lexical items, there was little correlation either with the ability to induce valid patterns (r = -0.19) or with the ability to self-correct (r_{pbi} = 0.14). Neither of these was significant. However, there was a negative correlation between the number of patterns of usage and the ability to apply the patterns (r_{pbi} = -0.41; $p < 0.05$). This suggests that for lexical items with a large number of different patterns of usage, it is less likely that students will apply the patterns they induce while self-correcting their errors.

4.4 Effects of number of meanings

The number of different meanings of the lexical items according to the COBUILD English dictionary (Sinclair, 1995) was also compared with students' ability to induce valid patterns, to apply patterns, and to self-correct. Again, there was non-significant negative correlation both with the ability to induce valid patterns (r = -0.30) and with the ability to self-correct (r_{pbi} = -0.11). However, there was a significant negative correlation between the number of meanings and the ability to apply the patterns (r_{pbi} = -0.38; $p < 0.10$), suggesting that for lexical items with a large number of different meanings, students were less likely to apply the patterns they had induced in self-correction.

5. The process from induction to self-correction

We have seen that there are many arguments in favour of induction in the literature and that the students in this study are generally able to induce valid patterns from their concordances. However, if the students cannot apply such inductions in their language learning and their language use, the ability

to induce rules is of little value. We therefore need to examine the relationship between inducing patterns, applying patterns and self-correction.

Even though there is no significant relationship between the ability to induce valid patterns from the concordances and the ability to apply the patterns (r_{pbi} = 0.15), there is a very strong positive correlation between the ability to induce valid patterns and the ability to self-correct (r_{pbi} = 0.76; $p < 0.001$). In other words, if students induce valid patterns from the concordance, they are likely to be able to self-correct their errors. The ability to induce valid patterns is therefore applied by the students in their learning and is likely to be valuable.

6. Conclusion

Although the sample size in this study is small, the findings suggest that the learners are able to induce valid patterns from self-selected concordances and to use these patterns in self-correcting errors. Learners are most likely to induce valid patterns and to self-correct for adjectives. They are also more likely to be able to apply the patterns induced for lexical items with few patterns of usage or meanings. Teachers wishing to follow the approach used in this study may therefore want to take these factors into consideration when choosing lexical items for which learners are expected to make concordances and self-correct. In addition, students who are able to induce valid patterns from a self-selected concordance are also more likely to be able to self-correct. Although the nature of this relationship is unclear, it is possible that training in induction or self-correction will have broader effects than the immediate focus of the training. In this way, learners can grow to be

less dependent on the teacher while induction from concordances and self-correction are still emphasised in teaching.

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Appendix The lexical items used in the study.

accuracy	attached	capable	choose
classify	competition	damage	difference
different	different	divide	following
group	guarantee	include	industrial
lightweight	melting	operate	replace
result in	used to	various	