

IN PRAISE OF LINGUISTIC PROBLEM-SOLVING

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Abstract

The article looks at problem-solving as a means of internalising second language grammar. Problem-solving in this context refers to a type of learning that is conscious, inductive, and heuristic. In the problem-solving framework, as outlined in this paper, grammar learning is thought of in terms of two complementary processes, viz. 'rule-getting' and 'rule-using'.

The problem-solving procedure commences with problem-posing, and proceeds through data analysis, hypothesis forming and testing, and frequent rule re-structuring, to the final rule formulation. This is followed by 'rule-using', a dynamic process in which rules are constantly being reformulated and form-function correlations are being worked out.

Contrary to Sheen (1992), who dismisses problem-solving as "a seductive hypothesis", the author argues that linguistic problem-solving should play a key role in second language learning, especially in the case adult L2 learners.)

Linguistic Problem-solving:

The use of problem-solving as a communicative interactive technique in second language learning has long been advocated by writers such as Prabhu (1987: 137), Sadow (1983: 115-120), and Klippel (1984: 102-114). This type of task-based problem-solving has more recently been elaborated by Skehan (1993), and Estaire and Zanon (1994). Communicative problem-solving tasks of the following type are commonplace.

Example:

Problem: You and six other teachers have been asked to form a committee to organise an essay-writing competition for secondary schools in your region.

At your first meeting agree on:

- 1) objectives
- 2) categories
- 3) length of essay
- 4) theme

- 5) rules
- 6) entry procedure

Follow-up tasks:

- 1) seek funding and do costing
- 2) advertise the event
- 3) design a flier / entry form
- 4) set deadlines
- 5) appoint judges and agree evaluation criteria
- 6) arrange prize-giving function

In this case the point of departure is a real-life problem, and the new language, which is fed in as the need arises, is acquired as a by-product of the activity in which the learners are engaged.

There is, however, another kind of problem-solving which is much less widely known, viz. linguistic problem solving, in which the 'problem' is located within the target language system, and is often grammatical in nature. Elsewhere, (Bourke, 1991; 1992) the author has investigated the claim that problem-solving builds linguistic competence and has provided compelling empirical support for its pedagogical effectiveness. The research looked at the arguments and evidence in favour of the hypothesis first proposed by Winitz and Reeds (1975) that "Language learning is a problem solving activity.....grammars can be internalized by encouraging subjects to solve grammatical problems in much the same way that a young child solves (constructs) the grammar of his native language."

A related, but rather different exposition of grammatical problem-solving appears in Ellis (1991).

Problem-solving in this paper refers to two complementary learning processes, viz. 'rule-getting' and 'rule-using'. Rule-getting refers to the induction of grammatical rules by means of guided discovery. Learners are not given the rule or allowed to look it up in a reference grammar. Instead, they are confronted with instances of the grammatical problem, which they analyse and from which they induce a generalization about its form and function. They are given various tools for the job, such as texts, examples, hints, worksheets, etc.

It is one thing to know a rule; it is quite a different matter to use it correctly. Essentially all grammar has to do with the making of meaning and rule-using,

in the present context, refers to the use of rules to express grammatical notions. Learners need to be given the opportunity to use the rules they are working with in order (a) to confirm that the rules actually work, (b) to observe how a new rule interacts with other rules, and (c) most importantly, to explore the mappings between linguistic structures (e.g. modal verbs) and their communicative values (e.g. obligation, ability, certainty, etc.). It is crucial that learners themselves discover how various bits of grammar combine with lexis to make meaning.

Before looking at rule-getting and rule-using in some detail, I should like to outline the rationale for linguistic problem-solving, and also spell out the limitations of the conventional approach to grammar teaching.

Why Problem-solving?

Here are some of the main arguments supporting linguistic problem-solving.

- (i) Problem-solving exploits the learners' natural tendency to work things out. If, as Seliger (1988) asserts "the central learning process for acquiring a language is hypothesis testing", then there is no reason why this natural process should be violated in classroom. Studies in child language acquisition demonstrate that in language learning one cannot proceed very far without attempting to form hypotheses. The child's emerging interlanguage shows a gradually developing rule system. A classical example of this phenomenon is the much-quoted "wug test" (Brown, 1973) which shows how children apply the plural -s morpheme to nonsense words.

Skehan (1983) claims that in order for learners to internalise the L2 system they must be given the opportunity to allow their existing interlanguage to grow. Teaching must allow them to formulate new hypotheses, abandon inadequate ones, and restructure their internalised grammar.

Whereas Krashen and the "acquisition" school claim that all of the above happens naturally and subconsciously wherever learners are exposed to comprehensible input, it is a valid empirical question to ask whether certain types of explicit instruction, such as problem-solving, can complement SLA or even compete with it for certain types of learners.

- (ii) Problem-solving promotes what is known in the educational literature as "significant learning", i.e. learning which is both self-discovered and

meaningful. It enables learners to discover knowledge, internalise it, and subsequently reproduce it. Problem-solving requires greater depth of processing, which in turn leads to better retention (Craik & Lockhart, 1972). In other words, it cultivates ‘deep’ rather than ‘surface’ learning. It is more concerned with making sense than with reproducing facts. It challenges the learner to address questions, evaluate evidence, and infer generalizations based on the data observed.

“Problem-solving is an educational activity. Assembling and considering evidence to reach viable conclusions is an educational process. Self-reliance and independence are educational goals”. (Willis,1993).

The way we learn at school affects the way we subsequently live. If our learning experience encourages creative and critical thinking, we will be in a position to cope with change in a rapidly changing world (Lumsdaine & Lumsdaine,1995).

- (iii) Problem-solving is an enjoyable activity when success can be achieved. It is a well attested fact that learners learn like wildfire when they are interested and actively engaged in the learning process. It may be slow initially, but like a field of corn, after a slow germination period, it suddenly begins to sprout and grow rapidly.

Deductive Teaching vs Inductive Discovery:

The conventional approach (i.e. deductive) to grammar teaching / learning does not seem to have worked very well. For instance, looking at the spoken language of Bruneian student teachers, Blubaum and Chin (1995;19) report that in one hundred minutes of recorded material there were over two hundred grammatical errors.

The deductive (Explicit Formal Instruction) model one often finds in textbooks (e.g. Gethin ,1989) rests on an ordered progression from EXAMPLES to EXPLANATION to EXERCISES. As Pearce (1990) and others have pointed out, the conventional model is seriously flawed. It is teacher-centred and there is minimal learner participation. It is largely predictable, boring and unchallenging for the learner. It often misses the crucial ‘problem’ facing the learner. For example, it may deal with each of the English tenses individually, yet fail to account for tense switching in a text. It thus presents a very fragmented view of the language system.

Moreover, it rests on the assumption that grammar is 'received' in prefabricated chunks (or "accumulated units" as Rutherford calls them), and it makes no reference to one's internalised grammar which is not acquired in a fully-blown form but evolves slowly over time. It seems quite pointless, therefore, to put learners through a series of grammatical hoops as many textbooks do. A traditional taxonomic approach tells us nothing about the mental processes at work, and it does not have much relevance within a 'discovery' approach. What is meant by a problem-solving approach to grammar is that learners must play an active part in discovering significant facts for themselves. Rules, therefore, are not prescriptive statements in the traditional sense, or long lists of structures, but generalizations found to operate in a number of specific instances.

A problem-solving approach (i.e. inductive) rejects the view that all language learning takes place 'underground' as a product of the hidden processes of the mind. While it cannot be denied that children acquire their mother tongue without invoking conscious cognitive strategies, it cannot be assumed that the same procedure is either possible or desirable in the case of L2 learners, and especially adult L2 learners. Many adults feel the need for well defined 'discovery procedures' which they can use to map out the target language structure. Since their learning style is largely analytic and formal, it would be counter intuitive to reject learning. Besides, it is not always possible to replicate in the L2 classroom the conditions necessary for natural acquisition. And since most second language learning takes place in acquisition-poor environments, viz. classrooms, it would be unwise to rely on 'nativist' procedures.

A problem-solving approach to grammar teaching / learning has none of the limitations of the traditional formula, i.e. the textbook sequence of example, explanation, and exercise, or indeed the recommended pedagogical stages of presentation, practice, and production . It is more a journey of exploration. Nothing is certain. It is a quest that is not guaranteed at all, and the outcome may be quite different from one's initial expectation. It is learner-driven, i.e. learners work through to the solution themselves. They are actively involved at all stages. They start working on the problem immediately, either individually or in groups, and they pass through a number of linked operations on their way to the final solution. They have to think and make decisions. Their attention is focused for teacher input. Some of the tools for the job may be provided; others may have to be devised by the learners themselves. Language learning is thus viewed as an active cognitive event and not as

a passive feeding process. In the words of the poet, W.B. Yeats, "Education is not the filling of a pail, but the lighting of a fire."

Rule-getting Procedures:

Where do problems come from? In the context of grammatical problems, problem-finding is done by the teacher, mainly by examining the output generated by the learners in question, as it is exhibited in classwork, diagnostic tests, and student profiles. In my experience of teaching English as a second language over some thirty years in Africa, the Middle East, and South East Asia, I am convinced that there are a great number of language problems to be solved. The real question is how best to go about this mammoth task.

In any problem situation the first step is awareness-raising or 'noticing,' which obviously depends very much on the nature of the problem and the reasons for its being a problem. In my research (Bourke, 1991; 1992), the problem-solving task is presented by means of 'perceptual frames', i.e. short dialogues, narratives, expository texts, etc. which serve a two-fold purpose (a) providing a meaningful context to demonstrate instances of the problem, and (b) as a means of cueing a tentative hypothesis.

The input frames will contain several instances of the 'problem.' Thus, one may want to highlight and explore a particular tense, or article usage, or any other part of the language system. Using a problem-solving procedure, one does not state the rule; the learners have to infer it from the data presented. Learners might be asked to identify each instance of the targeted item, observe its forms, and its distribution, and then infer a generalization governing its usage based on the clues provided. The learner then formulates a tentative rule and tests it against further instances of usage in subsequent frames and in this way restructures his internalised grammar.

The problem-solving procedure is a simple recursion comprising three moves:

1. Read the next frame.
2. Form a current hypothesis.
3. Test, and if necessary revise your current hypothesis.

The resulting 'rule' is unlikely to be elegant in a linguistic sense; all interlanguage is *pro tempore* and subject to ongoing restructuring. In this respect linguistic problem-solving mirrors the natural process of language

acquisition, the main difference being 'input enhancement', i.e. the input is structured so as to make it more salient.

Any piece of language can be targeted for exploration. For instance, my students have used the problem-solving procedure in the study of articles, determiners, verb tenses, sentence combining, passive voice, etc. But as Krashen (1982:98) correctly notes, many aspects of English grammar (e.g. articles) are very complex and almost defy linguistic explication. All the more reason, therefore, to treat them as problem areas to be solved in a systematic manner. All grammar is systematic up to a point; beyond that point one has to learn to live with complexities and grey areas.

The type of rule-getting activities one uses will be determined largely by the nature of the problem. At all times, however, it is important to avoid stimulus overload by presenting too many problems at too fast a pace in contexts which are too contrived and / or too complex.

Rule-getting exercises can range from observation of syntactic patterning and processes, to the making of judgments and discriminations, to the articulation of rules. It can be effected by:

- (1) *'Noticing'*: [Also referred to as consciousness-raising (C.R.) and 'input enhancement'.] According to Schmidt (1993:4) 'noticing' is "the necessary and sufficient condition for the conversion of input into intake" i.e. language which has been internalised. 'Noticing' can be effected by various types of language analysis, at the micro level (i.e. word, phrase, or sentence) or at the macro level (i.e. whole text) . It is best if this analysis is done with language that has already been processed for meaning.
- (2) *Cloze procedure*: Selective cloze procedure can be used to focus attention on specific language items. In this case, instead of random deletion, either function words (i.e. pronouns, articles, determiners, etc) or inflectional morphemes are deleted (Madsen, 1983:51).
- (3) *Error detection and correction*.
We are told that "there is no learning without goofing". Interlanguage errors indicate a state of normality in language learning and disappear as the learner restructures his or her internalised rule system. However, in the case of adult learners one may encounter fossilised errors, which

are resistant to acquisition and can only be shifted by systematic remediation. It is not sufficient in this case to focus only on repairing performance errors; one must seek ways of making the learners themselves conscious of their system errors. Towards this end it is clear that many learners require (a) language awareness exercises and (b) confidence-building activities.

Rule-using Procedures:

The second aspect of linguistic problem-solving that I wish to discuss is 'rule-using', i.e. the growing use of grammatical rules to achieve expression. This is something close in meaning to Rutherford's (1987) notion of 'grammaticization'.

L2 learners cannot be exposed to the complete set of constructions in the new language. Instead, they have to isolate some general grammatical properties that they can project to novel utterances. The extension of the newly formulated rule to other situations is crucial to learning, providing confirmation and clarification of the grammatical point under study, and also serving to refine the rule, by introducing formal or pragmatic constraints on its use. In other words, we cannot be said to 'know' a grammatical rule until such time as we have successfully deployed it in specific instances. In Chomskyan terms, rule-getting concerns linguistic competence while rule-using concerns performance.

It is clear that the pedagogical instruments needed for rule-using cannot be those employed in rule-getting. Whereas rule-getting activities are designed to raise grammatical consciousness by highlighting salient features, demonstrating syntactic processes, and showing how language works, rule-using obliges the learner "not only to 'notice' but also to 'perform' an operation of some kind. In other words, it is C-R activity that is task-oriented, where the learner is actively engaged in solving problems." (Rutherford, *op.cit.* 153)

Unfortunately, over the years, grammar production exercises have tended to focus on the formal aspects of isolated sentences. Very often pattern drills, substitution tables, and slot-filler exercises were used, which were notable for their banality, meaninglessness, and lack of contextualization. An extreme example of this type of meaningless work appears in Sheen (1992;58) whose written test consists of disembodied sentences, as follows:

1. The house has a red roof.
2. Do you have a bicycle?
3. We have a beautiful house.
- 4 . Who has a black dog? etc.

Elsewhere, the ancient grammar-translation method has long since died a natural death, and a whole range of communicative interactive techniques has mercifully made the teaching of grammar more rational, more stimulating, and more challenging.

The purpose of rule-using is to provide learners with meaningful practice in using the lexical and syntactic resources of the language. It is essentially an enabling type of activity, paving the way for more open-ended tasks such as discussions, reading comprehension, essay-writing, etc. which are part and parcel of academic discourse. The progression of task type, therefore, is as follows:

rule-getting ==> rule-using ==> academic discourse

The reason that many college students experience difficulty in coming to terms with academic discourse, and in particular academic writing, is, I believe, that sufficient groundwork has not been done in exploring the language system. In a word, we focus more on the product than on the process. We 'drill in' a large number of sentence patterns, but fail to impart the generative power to create discourse. The major attraction of problem-solving is that it combines process and product. Rule-getting engages learners in 'noticing' and formulating rules, while rule-using enables them to 'proceduralize' their knowledge (Batstone, 1994)

Amongst the exercise types that might be employed for rule-using are:

(1) *Propositional clusters:*

Rutherford's "propositional cluster" (op.cit.:167) is a skeletal sentence, consisting of an unmarked verb and its associated noun-phrases. The learner has to 'grammaticize' the cluster into a well-formed sentence. The effect of discourse on surface form can be easily demonstrated by providing a context, such as the following:

Round the corner came a boy.
ride - he (boy) - bicycle

The most natural realization of this cluster would be:

He was riding a bicycle.

Semantically, it is obvious that the 'deep structure' in this case has to be realized as an active string. The task also involves an understanding of the given / new discursal principle whereby 'boy' rather than 'bicycle' is chosen as grammatical subject. Furthermore, one also notices that the repeated noun-phrase ('boy') is replaced by its pronominal equivalent ('he').

The propositional cluster has several pedagogical advantages. It is easy to construct yet it clearly demonstrates the 'ripple effect' of syntactic or discursal choice on sentence structure. It serves to highlight the interdependence of syntax, semantics, and discourse. Finally, the level of complexity can be varied in several ways; for instance, by the number of functions assigned to the verb, by the use of premodification, by the introduction of modality, and by the elaboration of embedded material (e.g. Rutherford 1987;167):

want - child - [sing - child - song]
 " The child wanted to sing a song."

(2) *Text reconstruction:*

There are several types of text restoration exercises which can be set up to elicit specific syntactic or lexical items. The most widely used exercise of this type is the Cloze procedure, which is normally used as a testing instrument, but which, in my view, is too good for testing purposes only. It can also be usefully exploited for teaching purposes. For example, having analysed article usage in English, learners could be asked to re-create a text in which all the articles have been deleted.

(3) *Dictogloss:*

Another very promising technique that can be used to enable L2 learners activate their knowledge of the target language system is dictogloss. This is a very different activity from traditional dictation, its main features (Wajnryb,1989:16) being:

- (a) The text used should hang together as a semantic whole. It should display the features of a well-written paragraph in terms of topic development and textual coherence. It should normally be quite short, anything between three and seven sentences long. It should not be lexically overloaded and it should have a structural focus.

- (b) The students are placed in small groups and the text is read at normal speed, sentence by sentence, and not word by word or phrase by phrase, as in traditional dictation. The pause between sentences may be slightly longer than usual. During the dictation, students note down key words and phrases, i.e. content words rather than structure words.
- (c) Next comes the re-creation stage. The students re-assemble their fragments into a coherent whole. It is a co-operative venture. The members of each group pool their notes and their linguistic resources to reconstruct the text. However, the aim is not to generate an exact replica of the original. As Wajnryb notes: "It may help to think of this procedure as the opposite of cloze: in the cloze, we have a text with holes or gaps; in dictogloss we have fragments in need of a text."
- (d) Finally, we come to the whole-class analysis and correction stage, in which the different versions are read, discussed, and evaluated. The learners themselves are allowed to sort out errors and justify their positions. The focus of this activity will be the target structure and possibly other syntactic or lexical points related to it.

(4) *Sentence Combining:*

Ability to use complex sentences in formal writing is seen as an index of one's syntactic maturity. Sentence combining, therefore, has been and still is extensively used as a pre-writing exercise (cf. Strong, 1994). While expressing certain reservations on its use Zamel (1980) and James (1994) concede that sentence combining is an effective exercise. What it seeks to do is to give learners a handle on the transformational rules that come into play whenever two or more simple sentences are combined. "...no-one would deny that text creation involves combining simple propositions into complex ones, introducing reservations, dependencies and contingencies." (James, op.cit.:1) It covers an enormous area of English grammar, ranging from co-ordination to subordination, adverbial clauses and their respective connecting 'transitions', and all the complex transformations associated with the embedding of noun and adjective clauses.

My first year Certificate students in the Faculty of Education seem to experience great difficulty in forming compound and complex sentences.

One problem in particular, which seems to be endemic, concerns adverbial modification.

e.g. * Although she was ill, but she went to school.

This problem can be presented as a sentence combining puzzle to which learners must attempt a solution, and guided by observation and feedback, build up an understanding of these complex manipulations. For instance, learners might be given a set of simple sentences which have to be re-assembled as a single complex sentence with the nature of the relationship between each clause being signalled.

e.g. It was raining (CONCESSION)
 We played tennis. (MAIN IDEA)
 It was great fun. (ADDITION)

One possible outcome would be:

Although it was raining, we played tennis; furthermore, it was great fun.
 Alternative concessive markers could be noted and practised.

e.g. Even though X, Y.
 Despite the rain, Y.
 In spite of the rain, Y.
 In spite of the fact that X,Y.

Later, the problem-solving task can be made more demanding by requiring the learners to re-arrange and connect a series of unsignalled simple sentences into a single complex configuration. However, as Zamel (op.cit.: 86) points out, improvement in syntax does not necessarily imply improvement in rhetoric, and like any type of language exercise removed from its natural habitat, sentence combining can easily degenerate into a mechanical a-rhetorical routine. It is advisable, therefore, to recycle the resulting complex sentences in a piece of sustained writing, such as an essay, because the unit of written discourse is not the sentence but the 'conceptual' paragraph.

Let us now see how the twin problem-solving processes of 'rule-getting' and 'rule-using' work together to solve a specific grammatical problem

Solving the “Passive” Problem:

Let’s suppose the problem is the passive voice. Traditionally, the topic is presented by means of examples and an explanatory diagram showing how

X did Y

can be rendered as

Y was done by X

The passive transformation is then applied to various active voice sentences across a range of tenses and after all of this manipulatory practice, learners are given further practice, usually by means of transformation drill, oral and written.

From a problem-solving perspective this type of deductive exposition and mechanical practice is not only useless but harmful. It does not sensitise learners to the value of the passive, nor does it allow them to explore its functions, or observe its typical contexts of use. It is misleading in that it gives the impression that any English S-V-O sentence can be passivised willy nilly.

In my problem-solving lessons, I aim first and foremost to sensitise learners to the purposes for which the passive is typically used. I have them compare two texts which give different accounts of the same event, e.g. a personal letter describing a recent disaster, and a newspaper report of the same event, along the lines suggested by Grellet (1988). In pairs, my students read and discuss both texts, and work through a series of awareness-raising questions.

Text 1:

The quake jolted the port city of Kobe. It killed some five thousand people. It hit the Bay area worst of all. etc...

Text 2:

The port city of Kobe was jolted by a massive quake. Some five thousand people were killed. The Bay area was hit worst of all. etc...

Questions: (*on handout*)

1. Underline the verbs in Text 1 and describe the relationship that exists between the active subject and object.
2. Underline the verbs in Text 2. Is the subject - object relationship still the same?
If different, say what has happened.
3. In Text 2, we are more interested in what happened to B, rather than in what A did. Give a reason for your answer.
4. In Text 2, the information in object position is sometimes deleted. Why does this happen?
5. Apart from a difference in form, what feature is shared by all the verbs in Text 1 and 2? Why are some of the verbs in Text 2 not passivised?

Then, another short text is presented, e.g. how glass is made, and learners are asked to rewrite it in the passive voice. The text may include certain verbs which cannot be passivised and from these gradually introduced instances learners will induce some of the main constraints on passivisation in English. In this way they will gradually come to realize that (a) the passive voice preserves meaning, but (b) allows us to shift the focus of attention in discourse.

It is best to use a variety of authentic short texts, so that the learners can see that the passive is not just the mirror image of the active, but has its own special functions and contexts of use. Initially, and for quite some time, the lessons will naturally focus on the central or 'agentive' passive with monotransitive verbs. Later on, other passives are introduced, e.g. the pseudo passive (The team looked beaten.), alternative passives (It is expected that...), and the related causative construction (Miriam had her hair dyed.).

Each phase of rule-getting is followed by rule-using. Here, to begin with, one can use simple pseudo-communicative matching tasks, such as linking items by an appropriate passive verb:

corn		Japan
coal	grow	France
tin	produce	Malaysia
cars	mine	Poland
wine		Sweden

Very soon, however, learners should be set real communicative tasks, such as describing a process as depicted in a series of sketches or symbols, for instance, coffee-making in Brazil.

The Teacher's Role:

The success of the problem-solving approach will depend in large measure on the teachers' ability and willingness to apply it to a variety of problems in their teaching situation. The pedagogical load is heavy. Having determined the learners' needs and selected and graded the 'problems', the teacher has to write or at least adapt appropriate materials and arrange them in frames according to a pre-determined plan. The preparatory work would include:

- (a) Needs analysis.
- (b) Definition of the problem(s).
- (c) Identification of the data elements needed to generate a solution
- (d) Checking the form, accuracy and sources of the data.
- (e) Preparation of a clear statement of instructional objectives and teaching outcomes.
- (f) Selecting the best procedure(s) to attain one's objective.
- (g) Adapting or writing materials keyed to the teaching specification.
- (h) Writing suitable testing materials.

In the classroom, the teacher's role is essentially that of facilitator of learning. Teachers should keep a low profile and not tell learners anything that they themselves can discover. Teacher responsibility here includes the following:

- (a) Giving operational instructions.
- (b) Giving guidance in the form of prompts and individual help when required.
- (c) Managing the class or group discussions which follow each input session. While learners discuss their trial solutions and justifications, the teacher may point out inconsistencies and suggest or elicit a new line of enquiry.
- (d) Providing feedback when it is not available elsewhere.
- (e) Developing a suitable metalanguage and recording the rules formulated by the group.
- (f) Noting any deficiencies in the materials or procedures and revising them accordingly.

In summary, problem-solving can only work in an open-ended learning environment, where learners are encouraged to play an active role in exploring linguistic problems and are provided with the necessary system support. The teacher's role may best be described as supportive and non-invasive.

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