Listening to listeners: methodological issues in an investigation of listening difficulty

Richard Pemberton

Introduction

In this discussion I will focus on questions of research methodology arising from a preliminary investigation of the listening comprehension difficulties faced by a group of students at Hong Kong University of Science and Technology. The results of the study are discussed in Pemberton (1993); here I will focus on the methods used to elicit data.

In planning an investigation into difficulties in listening comprehension, it became obvious that gaining access to reliable data would be no easy matter. Whereas speaking and writing involve converting a meaning into a linguistic form (output), listening and reading comprehension involve an extra stage before evidence of processing is available to the observer: linguistic form (input) \(\rightarrow\) meaning \(\rightarrow\) linguistic form (output). We can, thus, only guess at the way that input (phonological or orthographic) is processed and meaning arrived at. Moreover, it seemed unlikely that second language speakers would be able to emulate the rapid on-task production of trained or educated native speakers such as shorthand typists and those who can 'shadow' speech while listening to it and repeat words in continuous speech when little more than half the word has been said (Marslen-Wilson & Tyler 1981). Nor did it seem likely that the on-task verbal reporting that has been used in studies of reading strategies would have any chance of success with listening comprehension, due to the rapid processing required.

However, despite the problems in gaining access to the processes involved in listening comprehension, I hoped that verbal reporting might provide some insight into the difficulties faced by tertiary EAP listeners. In addition, I decided to use a number of more traditional testing instruments such as dictations and listening clozes. It was hoped that this initial combination of approaches would lead to the creation of an improved research design for future investigation of difficulties in listening comprehension.
Using verbal reports as a method of data collection

Types of verbal report

In the literature, introspection serves both as an umbrella term for verbal reporting (cf. Fæøch & Kasper 1987) and as one particular type of verbal report (cf. Cohen & Hosenfeld 1981). Here (following Cohen & Hosenfeld 1981; Cohen 1984) it is used as one particular type of verbal (or self-) report. These are divided by Cohen & Hosenfeld into thinking-aloud and self-observation reports. Thinking-aloud activities are described as those in which the subject verbalises his/her thoughts within a few seconds of making them, and with no analysis; self-observation data, by contrast, are not obtained so rapidly, and generally involve some analysis. To clarify the differences between the various types of verbal report, Cohen & Hosenfeld (op. cit.:287) imagine responses to the following text:

There were many exigencies that kept him from dealing with the matter until it was unfortunately too late. The inexorable damage had already been done.

Thinking-aloud data from somebody reading the above text, might, according to Cohen & Hosenfeld, be something like “Now, let’s see. There were many exigencies that ... What are exigencies? I’ll read on. O.K. These things kept him from dealing with the matter ...”. By contrast, self-observation data (with limited analysis and abstraction) obtained from someone reading the same text might look like “Let’s see. O.K. I read along and stopped briefly at two words I wasn’t sure of ...”, while self-observation (with extensive analysis and abstraction) might produce “Let’s see. This segment of text illustrated for me how I tend to use contextual clues to guess the vocabulary words that I’m not sure of...”. In other words, the two-way distinction has now been extended into a three-way one, ranging from the as-it-happens thinking-aloud type of report (parallel to the ‘stream of consciousness’ method of writing) to the reporting of what has just happened, to the report that moves from a particular to a generalised comment. Cohen & Hosenfeld also distinguish between types of self-observation data on the basis of the time that has elapsed between the process and the report, immediate self-observation (within a few seconds) being referred to as introspection, and delayed self-observation as retrospection.

Cohen (1984) uses the terms self-revelation for thinking-aloud reports, self-observation for introspective or retrospective reports and self-reports for reports that make generalisations (about learning preferences, for example). Introspective self-observation would occur while the event was still in short-term memory, while retrospective self-observation would take place any time from about twenty seconds after the event onwards. As Cohen & Hosenfeld (1981) point out, introspective reporting about a particular event or process may become retrospective as the report continues. This type of retrospection they refer to as immediate retrospection. It is this type of verbal report, occurring very
soon after the event (and thus ranging from introspection to immediate retrospection, but classified under the general heading of *introspection*) that was planned for the present study.

**Advantages and disadvantages of verbal reports**

Verbal reports have been used in psychological research since early in the twentieth century, but came under attack during the heyday of behaviourism for their unscientific approach (Ericsson & Simon 1987). In the late 1970s and early 1980s, self-report data collection began to be used in second language acquisition research, and criticisms were soon voiced by researchers in the field. Several criticisms have been made and it is worth considering them carefully. Seliger (1983:188) raises the following objections:

(a) Learners are unable to report on processes (which remain subconscious), and merely report on linguistic products (which are easily accessible). Thus verbal reports may provide data about how learners use language, but not about how they learn languages.

(b) The task for the learner of remembering the path s/he has taken may interfere with the performance.

(c) Data from verbal reports are likely to be unreliable due to the strain that is placed on the learner’s memory.

(d) Much of verbal reporting is likely to be “post hoc guessing or inferring based on the product”.

To these we can add the following points, made by Seliger & Shohamy (1989):

(e) Learners may be affected by contact with the researcher, their own individual motivation to complete the tasks, or the setting of the experiment itself.

(f) Learners may find it difficult to verbalise while carrying out the task.

(g) Learners may provide the data that they feel the researcher wants to obtain.

(h) When insufficient data are obtained, it is impossible to tell whether this is because of limited cognitive or linguistic capacity.

(i) The burden of verbalising may interfere with the actual processing that is being commented on.

In contrast to item (a) above, there is a body of evidence showing that verbal reports can provide data about cognitive processes (Ericsson & Simon 1980; Hayes & Flower 1983; Cohen 1984). These studies suggest that where verbalisation is concurrent with the task (i.e. thinking-aloud), and subjects are required to verbalise only information that they would normally pay attention to, subjects are able to describe cognitive processes or strategies that they are
conscious of. However, retrospective verbal reports present more of a problem, due to the greater likelihood of information being lost from memory.

Items (b) and (i) relate to the effects of verbal reports on the actual processes they are meant to describe. Ericsson & Simon (1980) argue that with thinking-aloud reporting, the course of the cognitive process is not affected, so long as the subjects are asked to verbalise only about information they would normally pay heed to. With introspection or immediate retrospection, however, it is possible that the reduction in the verbalising load brought about by having subjects talk after completing a task instead of while carrying it out — item (i) — might be outweighed by the extra burden this would place on the memory load — item (b).

Items (c), (d) and (f) relate to the 'unreliability' and 'incompleteness' of verbal reports. Ericsson & Simon (1980) state that subjects may fail to report processes that have been lost from short-term memory, and may stop verbalising when the cognitive load is too heavy — items (c) and (f). This is obviously more of a problem for thinking-aloud than for retrospective reporting. However, non-concurrent reporting makes the inferring mentioned in item (d) more likely.

Item (h) follows from items (c) and (f): what can we judge from incomplete data? Incomplete data might result from cognitive overload or the inaccessibility of automatic processes (Ericsson & Simon 1980); or from the fact that information is often purged from memory once a task has been completed (Hayes & Flower 1983). They might also result from the inadequacy of the subject's linguistic skills for the task. In other words, the causes could be anything from cognitive ease to cognitive difficulty to linguistic difficulty. However, as Ericsson & Simon (op. cit.:243) point out:

Incompleteness of reports may make some information unavailable, but it does not invalidate the information that is present.

Items (e) and (g) appear to be cautions, and this should be borne in mind when undertaking any piece of research that involves human subjects. It is not clear why they would have any more relevance to self-report data collection than to any other type of research.

Overall, it seems that, in comparison with thinking-aloud reporting, introspective or retrospective reporting reduces the processing load on the subjects while increasing the memory burden and the likelihood of unreliability.

Despite the pitfalls involved, however, introspection (or immediate retrospection) was the type of self-report chosen for the present study, and it was not difficult to make the choice. Whereas thinking-aloud data collection is appropriate for reading activities, it is unlikely that the mind would be able to cope with the processing that is involved in chunking, recognising and interpreting
transient speech signals in a second language and, at the same time, create processing space for the production of thinking-aloud comments about the processes being undergone. To date, the few experiments which have involved verbal reports on listening tasks (e.g. O’Malley et al. 1989; Buck 1990) have elicited data that were introspective or immediately retrospective. The data referred to in the O’Malley et al. study are not, as they suggest, thinking aloud because, by definition, thinking-aloud procedures cannot involve the interruption of the process being reported on, as was the case in their study; a more accurate description of the research method used in their study would be introspection or immediate retrospection.

In the O’Malley et al. study, interviewers stopped tapes during pauses and asked the listeners to “relate as much as they could about their thoughts while listening” (op. cit.:426). In the Buck study, the researcher interviewed three listeners separately, using an open-ended discussion approach. This method has several strengths and weaknesses in comparison with the more formal method used by O’Malley et al., but at the time of planning the research I was unaware of the study and, partly for logistical reasons, opted for a more formal approach. Rather than focus on listening strategies, as O’Malley et al. had done, I decided to try to elicit data on the difficulties faced by listeners. Despite possible problems, I thought that the method of introspection (or immediate retrospection) might provide some useful insights into the sorts of problems that Hong Kong students face when listening to academic lectures in English.

**Experimental Procedure**

**Methodology**

It must be emphasised that the study described here was exploratory in nature, and that as there was no attempt to test hypotheses, there was also no attempt to control any of the variables that contribute to the complexity of the listening comprehension process.

Various methods were used to obtain data. These included introspection, dictation, transcription, oral repetition, listening clozes, note-taking (both handwritten and typed onto a keyboard that recorded the keystrokes), and comprehension questions. Many of these tasks were based on material from *Study Listening* (Lynch 1983), which was the core book for the course. With the exception of the tasks that involved speaking (oral repetition and introspection —see below), the tasks formed part of the participants’ normal coursework. Feedback was provided on their performance and participation in all the tasks was likely to be of benefit to them for their end-of-semester listening examination. As a result, the students did not appear to be flustered by the unusually experimental nature of the situation.
The research took place in a language laboratory in the last six hours of a 42-hour language enhancement course. The language laboratory allowed for easy recording and playback to all the participants at the same time. The participants were told that they could record their thoughts in whatever language they felt most comfortable.

**Participants**

The participants in the different exercises ranged in number from seven to eleven. They were all first-year undergraduate students belonging to a second semester EAP class at the Hong Kong University of Science and Technology. Students are assigned to EAP courses at the University on the basis of their Use of English grade at ‘Advanced’ (i.e. matriculation) level. Currently, students who achieve a score of D or below are required to take a language enhancement course; this number represents roughly three-quarters of all first-year students at the moment. The average scores of the participants in the two listening components of the examination given at the end of the first semester (dictation and listening comprehension) were 48.3% and 42.3%, compared with overall averages (for the 448 students who sat the examination) of 45.2% and 47.4% respectively. The average score on a listening examination taken at the end of the second semester was 70.2% for the participants, compared with an overall average of 65.7% (103 students). Thus, in terms of listening skills, the participants were fairly typical of the students taking EAP courses at the University as a whole.

**Introspection**

Three activities were used to elicit introspective data:

(a) The first exercise was an introspective activity: the passage, a tape-recording of part of a lecture on Arthritis (Adkins & McKean 1983), was played to the students, with pauses roughly after each idea unit; in these pauses the students were encouraged to voice any thoughts they had about that particular sentence or phrase, or describe any problems they had had when listening to it.

(b) The second of these activities involved delayed retrospection: two short passages, 30 and 55 seconds long (from Lynch 1983), were played to the students, who were asked to take notes while listening and then, at the end of the passage, to repeat the main points and explain any problems they had had when listening to it. At the end of the second passage, the students were also asked to explain their difficulties with both passages in more detail.
(c) The third activity could be classified as immediate retrospection. In this, a passage from the South China Morning Post was read out, tape-recorded and then played to the students as a dictation. After each idea unit, the tape was stopped, and in the pause after each phrase the students wrote down what they had heard and then indicated any problems they had had or explained the reason for the problems.

Other methods

Dictations were read aloud or played from a cassette in the usual way: once through at normal speed (for adjustment to the passage and getting a rough sense of its meaning), a second time with pauses after each idea unit (for writing down what was said as accurately as possible) and a third time at normal speed (for checking). The passages were taken from Time and the South China Morning Post (both read out by myself) and Study Listening (Lynch 1983). The students were used to my accent and delivery (as I was also their regular teacher) and, to a lesser extent, those of the lecturers recorded in the Study Listening material. There are four main speakers used in this material, and students had been introduced to excerpts from each of their lectures over a long period of time before being exposed to the full lectures. This does not mean, however, that the students were familiar with the spoken forms of the words that were used in the lectures: the major emphasis of the course was on the recognition of important points and the connection between ideas, with vocabulary being dealt with only in an ad hoc manner; only a small proportion of each talk had been heard in the earlier extracts; and the difficulty for the students in comprehending long stretches of connected speech clearly counteracted any practice effect that may have existed.

One passage was selected for transcription. This was a 90-second extract from Study Listening. The students had control over the rewinding of the tape and were allowed 35 minutes to complete the transcription. Another extract was chosen from Study Listening for oral repetition. Carrying out the activity in a language laboratory allowed individual student responses to be recorded during the pauses in the input.

One lecture from the Study Listening materials was used for a modified listening cloze exercise. Gaps were inserted in the lecture transcript where it was thought that the students might experience problems, or where the item was particularly important. Two other lectures from the materials were given for note-taking (see Appendix), and one of the lectures was also followed up by comprehension questions.
Discussion of methods

Introspection

Introspection did provide some data about students' listening difficulties. Students were able to pinpoint unknown words (both technical and non-technical) when introspecting/retrospecting on texts. Introspections also provided information about the difficulties of processing continuous speech—many participants mentioned that if they “missed” a few words, they would lose track of the meaning of a sentence. As one said:

I miss the last four words and maybe / I lose [...] concentration on the [...] last four words and so er / I have some difficulties in knowing the meanings of this sentence.

One student, attempting to make sense of the sequence in the incidence of skin cancers worldwide, said that he concentrated so much on incidence that he “missed” the following words. This suggests that the latter part of the sequence may have been lost before it could be broken into meaningful chunks and processed in short-term memory (cf. Rivers 1971; Anderson 1990). Sometimes, if meaning was constructed from partial information, it might turn out to be incorrect, as another student explained:

Because I miss some word then / er the meaning of the following sentence is completely different from the original one / so I got the wrong information.

These processing problems are, of course, exacerbated when the student is asked to take notes as well as listen. One student voiced a very common complaint:

I found that / I can’t [...] concerning in the first point how to write it down then the second point is coming and then I get lost / so I can’t get the last last point er / / then I missed all the thing.

Another explained that not knowing a word in one instance caused her to miss the point of a sentence:

I know that curat the word curative is a main word but I don’t know how to spell it and I try to spell it from [...] its pronunciation, so I miss the last point.

Students were also able to attribute difficulties to the speaker’s accent or rate of speech. The accuracy of these observations can, of course, never be taken for granted, but the fact remains that introspection does make them available for analysis.
As this study has focused on listening difficulties, no mention has been made so far of listening strategies. However, there is evidence from this research to confirm what was already evident from O'Malley et al. (1989) and Buck (1990), i.e. that immediate retrospection can elicit comments about listening strategies. Students mentioned guessing strategies that they used when faced with words such as resilient (in the utterance, Cartilage is very smooth, tough and resilient) and minor (in the sequence, Some are minor, some serious). One student was also aware of weaknesses in her note-taking techniques.

However, it became clear that there were a number of ways in which introspected data (as collected in this study) could be unreliable.

(a) Introspected data are inherently subjective. Unless corroborated by other data, they tell us only what participants think has happened. For instance, one student made the dubious claim that her inability to comprehend the sequence for thousands of dollars during the holiday was due to the fact that "the sentence are too long".

(b) If data are not collected in a one-to-one interview situation, it is impossible to control or direct the way that the participant chooses to respond. For example, at one point a student generalised about his learning strategies (self-reporting) instead of commenting on the difficulties caused by a particular passage (self-observing); another student responded in an emotional way to the Arthritis passage by expressing his feelings after several sentences and relating the experiences in hospital of himself and a friend. While such reactions may provide useful data, they may not be what the researcher had intended.

(c) When students described the problems they were having in listening to a particular passage or sentence, it was often unclear which particular words they were referring to. A typical response was, "In this sentence there is some word I can't understand."

(d) Sometimes, when the referents were known, the problem was unclear. One student said that he "forgot" the words fibrous tissue and several students stated that they could not "hear" a particular word or phrase (four out of eight said that they could not hear, or "missed", the dictated phrase for allegedly marking out in paint)—but in each case there was no clue as to what in particular led to the miscomprehension or loss from memory.
(e) In some cases, both the subject and the problem were unclear, as is illustrated by the following comment:

Er the sound is too / no feelings / and the voice is / is deep / and can I can't get it / the word maybe the word is I am also didn't know / / so I totally get lost.

Of the three activities used to obtain introspective data (involving immediate retrospection, delayed retrospection and immediate retrospection respectively), it is clear that the second one was the least useful. There seem to be a number of reasons for this. In part, it appears to be due to faulty research design: of the three instructions given at the start of the activity (to take notes and then, at the end of each passage, to repeat the main points and explain any listening problems they had had), the students in fact only carried out the first two—illustrating a drawback to the formal, non-interactive version of introspection, which does not allow the researcher to change direction or to focus the attention of participants on a particular point during the course of an activity. Because students had to retrospect, it seems that they had recourse only to the notes they had managed to take and not to the acoustic input on which the notes had been based. Students were able to say that they couldn't understand parts of the passage, but were unable (except when retrospecting on the very last part of the last passage) to indicate which particular word or phrase had caused them difficulties. Thus two students stated that they had not understood anything from the second half of the second passage (representing about 30 seconds of speech). Moreover, the emphasis on taking notes (i.e. trying to understand the main points) was at odds with the aim of trying to obtain information about problems with particular features of the input. This activity did produce comments on problems with note-taking, but threw very little light on particular phonological or lexical problems that listeners might be having.

By contrast, the first and third of the introspective activities, which involved immediate retrospection on brief sections of a talk, provided many more comments about difficulties with particular parts of an utterance. Students appeared to have had few problems in dealing with activities that required listening to an idea unit and then commenting on what (if anything) was difficult about it. They were also able, in most cases, to indicate which part of a phrase had caused them problems, suggesting that memory loss may not be quite such a serious problem with immediate retrospection as earlier thought. Memory loss did occur, however, and imprecision in identifying the causes of miscomprehension remains a weakness of immediate retrospection, as carried out in this study. It is likely that difficulties could have been highlighted more precisely (and the listener's memory refreshed) if the research had been carried out in the more flexible, one-to-one way described by Buck (1990). An informal, open-ended discussion causes its own problems, as Buck readily admits, but these would seem to be more than compensated for by several very important benefits: the researcher is able to adapt the interview as it goes along,
to probe for further information and to follow up interesting avenues that might otherwise be only hinted at.

Although all the participants in the study were given the option of introspecting in their first language (Cantonese), none of them chose to use it. Whatever the reason for the choice, this represents a possible weakness in the study: lack of clarity or completeness in the introspections might well have been due to difficulties with producing English, rather than receiving it. On the other hand, as Cohen (1984) points out, switching from second language (input) to first language (output) might alter or slow down the introspection. Further research might profitably compare first language and second language introspection for ESL learners.

**Other methods**

Transcription and dictation are methods that may not often represent real-life tasks for many listeners, and seem to contradict the aim of much current ESL teaching (listening and reading for the main point). However, leaving aside the question of their usefulness as teaching/learning methods, they have potential as research tools, when it is important to find out the particular sources of listening problems—something that message-oriented tasks such as note-taking cannot do. The advantages brought about by the possibility of repeated hearings or playings seem to be the following:

(a) The participant is likely (particularly with transcriptions) to make an attempt at most words—or at least at those words that s/he can perceive. The researcher is not confronted with a mass of incomplete data, as happens with student notes.

(b) Some initial misperceptions are corrected, but the more serious ones are likely to be more resistant to correction, and so to remain as evidence for the researcher.

(c) The difficulty caused to the listener by the unnatural task of having to pay close attention to each word is compensated for.

By themselves, though, they provide the researcher with only one piece of the jigsaw. Evidence from such sources needs to be corroborated by other research methods in order to find out from students what a certain word or stretch of speech means to them and what, if anything, causes them difficulty when listening to it or writing the transcription. Immediate retrospection, oral interview and oral/written comprehension tests are some of the methods that should be used.
Oral repetition appears to be useful in that acoustic input is reprocessed into phonological form for output without having to access an orthographic representation in the lexicon. It is thus more immediate than note-taking. However, it is ‘unnatural’ in that it requires word-for-word decoding and encoding (like dictation), and, more seriously, does not allow for modification in the light of later input (unlike dictation). Moreover, although written perceptions are available in dictations as the basis for retrospection, the same is not true of the perceptions that are translated into speech during oral repetition. It would be possible to replay the listener’s repetition as a stimulus for retrospection, but this would cause technical difficulties if it was to be done after each listening and repetition section, and would lead to inaccurate retrospection if carried out at the end of the whole listening passage.

Note-taking may be useful in studies where the focus is on the understanding of points and it is possible to follow up and probe. In this study, some notes indicated a lack of understanding of points and arguments (see Appendix) but there were also occasions where students successfully answered comprehension questions on points that had not been noted down. Thus the quality of notes taken could not provide reliable information about how well the student had understood the passage. (Successful comprehension despite faulty or missing notes is also reported in Palkovitz & Lore 1980 and Baker & Lombardi 1985; see also Rost 1990:125–127 for a discussion of the lack of a consistent correlation between note quality/quantity and understanding.) Moreover, even those notes which indicated a lack of understanding of main points did not provide any clues as to why the points had not been noted down. Breaking the listening input into short sections would make it possible for the students to retrospect on what they had taken notes about, but it would also make it difficult or impossible to get an overview of the text and decide whether a section contained important information or not. The process of taking notes of the main points cannot provide information on particular causes of miscomprehension.

The ability to record notes taken on a computer keyboard, and then to play the recorded notes back onto the screen at the same time as the tape-recorded lecture was played back, seemed at first as if it would be an exciting innovation. Researchers would be able to find out precisely what the acoustic input was at the exact time that something was written down—something that would only be possible with normal note-taking if the process was recorded with close-up video camera work. The reality, however, was somewhat less exciting. The difficulty of taking notes onto a keyboard (with the extra time and effort required to insert spaces, start a new line and delete errors, and the absence of symbols such as arrows to represent increase or decrease) would make this activity impossible for all but those specially trained for it.

If used in isolation, none of the methods mentioned above can provide reliable information about student problems with listening. Nor does a series of different methods applied to different texts, as employed in the present investi-
gation, provide a clearer picture of what precisely a learner is having difficulty with when a certain stretch of speech is being processed. It seems likely that a combination of methods, all used with the same passage, would provide more reliable insights. A possible combination would be dictation or transcription of idea units, followed by in-depth immediate retrospection after each listening segment and a series of comprehension questions to test understanding further at the end of the session. More pilot studies are needed in order to arrive at an effective methodology.

**Conclusion**

If the focus is on listening difficulties rather than on successful listening strategies, it does not seem to matter that introspection can provide access to conscious but not to automatic processes: as long as the introspection is immediate, listeners are able to pinpoint the source of their difficulties. On the evidence of this study, introspection clearly can provide information about the difficulties faced by EAP listeners. It seems likely that by using an informal interview setting, and following up points raised by the participant or suggested by the listening material, as described by Buck (1990), the usefulness of this information can be increased.

Of course, whether carried out in a formal or informal setting, introspective data collection will always be liable to the charge of unreliability. If introspection is to be used in the testing rather than the generation of hypotheses, then it needs to be combined with other research methods, all investigating an individual's responses to the same text. Claims and evidence of listening difficulty could then be checked against each other. Such a combination might include dictation or transcription, immediate retrospection and questions to determine comprehension. Further pilot studies are needed to arrive at an optimal combination.

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Appendix: Passage for note-taking

This is an excerpt from one of the lectures on which students took notes, with a particular student's notes on the right hand side. The notes appear to represent a failure to identify the speaker's main points, but without further investigation no conclusions can be drawn; reproduced from Lynch (1983:84) by courtesy of the author and Cambridge University Press.

Preventive Medicine

and frequently there are problems of disease (e.g. malaria, leprosy, tuberculosis) and so on! Where can we begin to tackle this problem? In the developing countries resources are limited and it is important that the most efficient strategy for success be employed or as early as possible.

Let's consider a case history. The problem of malaria. How do we eliminate malaria? Now there are three possible preventive measures: the first one would be to drain the marshes; get rid of the wet places where the mosquito breeds and thrives. The second strategy would be to kill the mosquitoes themselves (spray them with insecticide) and the third strategy would be to give all the people living in the affected areas anti-malarial drugs to take. And notice that we've three possible strategies. Not one of them involves the medical practitioner directly: the task of the civil engineer is to drain the marshes. The most important role in killing mosquitoes is played by the man with the spray gun who goes round the houses spraying the walls and ceilings. The key figure in distributing anti-malarial drugs is the home visitor. And finally there's the problem of the individual himself. We must educate him in the use of mosquito nets, especially if these are pressed on him by well-meaning but foreign personnel.

We can see the same/or problem of choice of strategies in the problem of improved nutrition. How do you get a better diet for people? One strategy would be to introduce new crops. The task of the agronomist (another might be to irrigate/irrigate the fields. The task of the engineer) is to improve crop yields. The task of the medical practitioner is to stop the malaria. And as the end of the day again we have the problem of the individual. You can persuade the farmer to grow new crops. You can help him to do it. But at the end of the day you must convince him to do it. And one of the major problems is persuading people to change their food habits. Man is his most conservative when he is concerned with filling his stomach.
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References


