Practical phonetics in the 21st century

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Abstract

This paper is concerned with the teaching, learning and assessment of practical skill in speech sound production which has formed part of general phonetic training in the British tradition for most of the last century, though it is presently in decline. We re-examine the purposes of production training, suggesting that the true purpose is widely misunderstood. We analyse the practices of this training in relation to recent pedagogical thinking and argue that it is student-centred, multi-sensory, and constitutes an unusual example of object-based learning. We scrutinise the arguments used by opponents of the practical approach and relate these to a prevailing scientism. We revisit classic formulations of the methods and benefits of practical training in the published literature, pointing out that even the most recent of these is now more than 20 years old. We indicate ways in which personal computers and mobile devices can now support a reformulated approach to practical training and encourage a reasonable and beneficial integration of practical and laboratory-based approaches to general phonetics.

Keywords: practical phonetics, performance skills, pedagogy, object-based learning, scientism.

1. Introduction

This paper is concerned with the teaching, learning and assessment of phonetics, not with the use of phonetics in teaching something else, such as second language pronunciation, but the basic foundation of an introduction to phonetics for anyone who wants or needs to know something about the subject. For an analysis of the various intersections of phonetics with aspects and applications of pedagogy, see [1].

Our focus is on a particular practical approach which formed the central component of general phonetic training in the British tradition for most of the last hundred years, though it is presently in severe decline. It is the type of training we had ourselves, roughly fifty years ago, and which we then passed on in our own long teaching careers.

2. Practical training in outline

2.1. Teaching

Typically, practical phonetics training was extended over one or more complete academic years and would involve a minimum of 20–30 hours’ small-group contact-time, and commonly considerably more. It might be an evening course, occupying 2 to 3 hours per week for a part-time student, or one course unit within a degree programme. It would typically include a series of weekly theory lectures, possibly attended by many students together, and smaller practical classes (ideally up to about 8 students).

2.1.1. The practical class

The practical class would work systematically through a graded set of incremental training materials—usually unpublished materials developed by the teachers themselves—designed to lead the student from simple exercises gaining mastery of basic articulatory manoeuvres such as control of glottal state to, eventually, the full range of human sound-types as set out in the IPA alphabet and chart. At the same time, auditory perception skills were also practised, the students hearing not only examples spoken by their teachers, but also analysing and critiquing each other’s performances of the novel sounds. An important feature of this teaching is that it happened live and interactively. The many small variations in multiple live repetitions of a token, together with varying ambient noise, and even such factors as the speaker facing variously this way and that during the class so that the room acoustics came into play—all this almost certainly helped to build robust perceptual categories. The requirement for students to attempt their own sounds while their peers listened critically—occasionally objected to by a few participants as a humiliating process—helped students overcome inhibitions and also broke down unrealistic ideas they might have harboured about their own performance. It is one thing to believe you can make a certain sound, but you are forced to be realistic if you make your attempt and find that the
three or four fellow students in your group can’t identify it.

2.2. Learning

The scheduled class-time spent on practical work was only part of the story. Motivated students always devoted equal or greater allowances of time to private-study practice. Students typically worked repeatedly over materials, either singly or in small self-organised groups, practising daily, and commonly using a mirror to monitor their articulations. Students devised their own drill, revision, and self-test materials (such as flash cards).

It has been said that the most accomplished phoneticians are always self-taught—Kenneth Pike and J. C. Catford are examples. But being self-taught doesn’t mean you have no formal instruction; you are self-taught if the major part of your expertise comes from individual practice. The best self-taught phoneticians had formal instruction too, and no doubt it provided important indications, though the real honing of skills depended on individual practice. In the same way, a musician needs formal musical instruction but also requires long hours of individual practice to excel.

2.3. Assessment

2.3.1. Dictation

The course-end assessment for a practical phonetics course would certainly include an ear-training (dictation) exam sat by a group of students together—again, done from a live performance from the examiner. An important component of this was formed by nonsense words, which were arbitrary language-like sequences. Words and phrases from real languages, previously established as being unknown to the listeners, were also used, as were both real and invented tone sequences. The obvious advantage of nonsense materials or previously unheard language examples is of course that when the listeners transcribe they cannot guess or rely on linguistic knowledge.

Each dictation item would be repeated a pre-announced number of times—maybe six or eight—and clearly, the delivery of accurate and consistent dictation material required considerable skill and practice from the examiner. When circumstances permitted, the dictation examiner might be a person previously unknown to the candidates, and a further qualified examiner or the appointed external examiner would be present as a critical observer, taking their own notes.

The scripts were then painstakingly graded against an explicit marking scheme worked out in advance, leading to an objective numerical score. The scripts were independently marked a second time by another examiner and any discrepancies or oversights in the grading were identified and corrected. After appropriate training, the best students typically achieved percentage scores in the 80s and 90s even with demanding material.

2.3.2. Oral

Each candidate separately took an individual oral examination in which they were required both to identify and to perform various arbitrarily-selected sound types, pitch sequences, etc., both from transcribed materials and in response to spoken directions given by the examiners. A more advanced examination would typically include the requirement to apply a cumulative succession of specified parametric modifications to a given starting point, potentially resulting in novel sound-types which are not represented by unitary IPA symbols, and which the candidate might never have previously attempted. Again an explicit marking scheme leads to a numerical score.

2.4. Place in the syllabus

It is worth repeating that the type of course we have described is merely one component of a study programme. Even a student on a specialist master’s programme in phonetics would typically also be following a comprehensive programme of courses in phonology, acoustic phonetics, sociolinguistics, and the phonetics and phonology of selected specific languages.

It will be clear that the description above is of teaching and learning which is—to apply some modern terms—student-centred and multi-sensory. It is also arguably an example of Object-Based Learning, since the learner’s own speech organs—together with the associated control and sensory mechanisms—provide the focus for understanding.

The approach was, of course, devised long before those terms became buzzwords in pedagogical theory, and those who created this approach to teaching certainly had no conscious conception of them. So what did guide the shaping of the practical approach, especially the emphasis placed on production skills?

3. Motivation for general phonetics training

3.1. Recognition

It has to be remembered that in its earliest days the IPA was an association of modern language teachers, and the chief use of phonetics knowledge was in
language teaching [2]. The earliest formal assessment in phonetics, the IPA Certificate examination, was essentially a qualification for language teachers. It was also understood that a language teacher needed phonetic knowledge not only of the target language but also of the interfering phonetic systems of their students’ first languages. But since the teacher of, say, French or of English might in principle have to deal with learners who presented with pretty much any human language as their starting point, the teacher needed a general phonetic ability, the ability to deal adaptively and intuitively with a hitherto unfamiliar phonetic system.

This might explain the importance attached to general phonetic auditory training, but still doesn’t tell us why production skills were so highly valued.

3.2. Production

Recognising a wide range of sounds is one thing, but it is hard to think of applications in which an ability to produce an unlimited range of speech sounds is a requirement, or even a useful accomplishment, so at first sight intensive production training might seem pointless.

3.2.1. Understanding phonetic theory

But Catford offers a description of the method which suggests the real motivation is different from what might first appear: “What is not […] obvious, but is undoubtedly the case, is that the acquisition of these ‘practical’ skills is by far the best way of acquiring a deep understanding of phonetic theory—of the principles underlying the description and classification of the sounds of speech …” [3: 2].

It certainly seems to be true that all the major advances in descriptive phonetic theory and classification have been made by phoneticians who did have this type of training: we can mention Henry Sweet, Daniel Jones, J. C. Catford, Kenneth Pike, Peter Ladefoged, and David Abercrombie. Nearer our own time, work on phonetic classification has become relatively unfashionable—perhaps a consequence of the decline of practical training. See [4].

4. Attitudes to practical phonetics

Practical training of the kind described has never been universal or widespread. It was chiefly a British practice, associated with figures such as Henry Sweet and Daniel Jones. It was exported in a limited way to the USA, but the chief proponents of it in that context, J. C. Catford and Peter Ladefoged, were themselves British. From the beginning, the legitimacy and value of the practical approach were denied by proponents of ‘experimental’ and ‘instrumental’ phonetics. Over 110 years ago Sweet spoke of ‘antagonism between the practical linguistic phonetician and the physico-mathematical instrumental phonetician’ [5: 109–110]. In 1935 the psychologist and experimental phonetician E. W. Scripture notoriously claimed that ‘the investigator might be, and preferably should be, congenitally deaf and totally ignorant of any notions concerning sound or speech’ [6]. This extreme language sounds like a defence mechanism: maybe he wasn’t a good practical phonetician and so decried the abilities he hadn’t got or developed. As a psychologist who had been psychoanalysed in Vienna, and was acquainted with Carl Jung, he should perhaps have known himself better.

But the rift between the two kinds of phonetics was an unnecessary and manufactured antagonism, fuelled as early as the 1880s by an excessive regard for the methods and trappings of ‘hard’ science. Even in the nineteenth century, phonetics textbooks were packed with impressive-looking but largely irrelevant anatomical, physiological and acoustic detail.
that the material is wrong (it is probably a conscientious summary of the state of knowledge at the time) but rather that it is useless for any practical purpose.

4.1.1. Chronology of experimental and practical approaches

It is important to understand that it was not the case that impressionistic phonetics came first, simply out of necessity, to be displaced by instrumental techniques as they became available. On the contrary, experimental and instrumental phonetics was a fashionable and relatively mature field before the IPA came into existence. Techner, for example was published in 1880—six years before the IPA was founded, and a year before Daniel Jones was even born.

If anything, the later development of practical phonetics by figures such as Passy and Jones was partly driven by the failure of the instrumental phonetics of the day to provide any results useful for application in fields such as language teaching.

5. Need for an up-to-date restatement

The most recent full exposition of the merits of practical phonetics training was provided by Catford [3]. It was published twenty years ago in the second edition of an earlier book, and the origins of that in turn go back more than half a century. The whole landscape of phonetics has changed since Catford’s ideas were formed. He still writes about ‘the techniques of instrumental investigation of speech’ as something separate from the ordinary student’s experience, to be encountered ‘sooner or later’. But this perpetuates an old division inherited from the days when the instruments of the phonetics laboratory were kept in their own room and used under supervision.

The situation now is entirely changed. Many tools of the phonetics laboratory are freely available—even to the solitary learner—on portable devices such as smartphones. There is no longer any obstacle to a complete integration of practical and experimental approaches.

5.1. Achieving integration

The proposal to integrate two long-separate practices is sometimes met with the question ‘How do you do it?’ To that our answer is simply that there’s no great secret: you just do it. You merely introduce instrumental techniques and impressionistic/auditory skills alongside each other from the start. Both of us have published textbooks which attempted an integration of practical and experimental approaches [9], [10].

If you segregate the two, putting them in distinct courses, or even in different chapters of the textbook, you merely perpetuate an unnecessary division. Many otherwise excellent recent works continue to do this [11].

The teacher also has a crucial part to play in fostering an integrated approach, since plainly the teacher needs to be equally comfortable with both aspects, and fully committed to the idea that the two approaches are complementary. Any hesitation or doubt on the part of the teacher will be detected by the students. Furthermore it is at the commonly disregarded and underfinanced foundation level where the most versatile teacher is required, since it is at that stage that students’ biases and prejudices are likely to be picked up.

6. Smartphone tools

Tools now available range from media applications familiar to all smartphone users (such as photography, video and sound recording), through smartphone versions of oscilloscopes, sound-level meters and signal generators, to speech-specific tools for spectrum analysis, fundamental frequency extraction, etc.

Figure 2. Closed and open phases of a bilabial trill produced by a three-year-old child, captured in slow motion at 920 fps on an Android smartphone.

Figure 2, for example, shows two selected frames from different points in a slow-motion video, and illustrates the potential for video capture of articulatory movement. For research purposes one might choose to use more elaborate equipment, but as a cost-free informal way of deepening one’s understanding of the articulatory manoeuvre the smartphone is superb.

In Figure 3 we see a short segment (24 ms) from a sustained [ɑ] vowel, captured on a free smartphone oscilloscope app.
The potential for a student to experiment interactively with their own voice, and thus deepen their understanding of notions such as periodicity, frequency and amplitude will be obvious.

A comprehensive set of speech analysis tools is available at
https://speechandhearing.net/laboratory/wasp/

Figure 4 reproduces screenshots from an Android phone showing these tools in use. The left panel shows syllables [ba pa pʰa] as might be used interactively in practising control of VOT; the right panel shows the English phrase The North Wind and the Sun were disputing which was the stronger and might be used, for instance, in the interactive control of intonation patterns.

6.1. How the smartphone is different

In one way, tools of the types just described offer nothing fundamentally new. Vibration of the lips in a trill might have been examined by means of a stroboscope well over a century ago, and cathode-ray oscilloscopes linked to microphones began to appear in phonetics laboratories in the 1930s. But the devices were expensive and cumbersome, and kept under lock and key. What the smartphone provides is unlimited personal access to the tools, at no cost.

Similarly, versatile speech analysis tools have long been available for use on laptop computers, but similar applications running on smartphones tend to be used more directly on the user’s own speech, since the smartphone itself (with its user-facing camera and microphone) is more obviously a personal accessory, in some ways resembling the small hand-mirror that was formerly the phonetician’s companion.

7. Conclusion

We have attempted to give an outline of the process of practical phonetics training as it was practised in Britain, and suggested that there may be some substance to Catford’s assertion that one of the surprising benefits of such training is that it fosters ‘deep understanding of phonetic theory—of the principles underlying the description and classification of the sounds of speech’. We have indicated some of the historical origins of a supposed ‘antagonism’ or incompatibility between practical and experimental approaches, and shown that in it is not the case that practical (impressionistic) phonetics came first, and was overtaken by the later development of instrumental methods. The two approaches existed side-by-side from the nineteenth century onwards. If the experimental approach is currently in the ascendant, it is on account of a prevailing scientism [12]—powerful now, but a factor from at least the 1880s—rather than because it has in any sense superseded the practical approach.

There need be no conflict. Practical phonetics training can still be done with profit. Indeed it can now be done better than ever thanks to the ready availability of powerful analysis tools, especially those running on the ubiquitous smartphone.

8. Acknowledgements

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9. References


