*Research Article*

# CAMBRIDGE ONLINE DICTIONARY AND VOCATIONAL STUDENTS' PRONUNCIATION OF ENGLISH VOWELS AND CONSONANTS

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**Abstract**

*Indonesian learners of English often have difficulty with vowel and consonant contrasts that do not exist in Indonesian, and vocational high school students in particular have limited access to models of spoken English. Online dictionaries with audio recordings and phonemic transcriptions offer a low-cost resource for pronunciation practice, but evidence of their use in vocational classrooms remains limited and largely descriptive. This study examined whether students' pronunciation of English vowels and consonants changed after instruction using the Cambridge Online Dictionary. A pre-experimental one-group pre-test–post-test design was employed with 17 Grade X students of a visual communication design class at a vocational high school in Pinrang, Indonesia, selected purposively. Pronunciation was measured through an oral reading test of words, sentences and a short text, scored with an analytic rubric. Four 80-minute sessions focused on listening to dictionary audio models, matching phonemic symbols with sounds and practising minimal pairs. The mean score rose from 44.06 before instruction to 82.47 after it, a mean gain of 38.41 points (95% CI [32.19, 44.63]). A paired-samples t-test showed that the difference was statistically significant, $t(16) = 13.10$, $p < .001$, with a large within-subject effect ($dz = 3.18$). All students moved from the Very Poor and Poor categories to the Good and Very Good categories. Because the design had no control group, the gains cannot be attributed to the dictionary alone. Nevertheless, the results suggest that dictionary-supported practice that links audio models, phonemic symbols and contrastive drills is a promising and accessible way to support segmental pronunciation in vocational EFL classrooms, and they justify controlled studies with larger samples.*

***Keywords:*** *Cambridge Online Dictionary; Consonants; Online dictionaries; Pronunciation; Vowels*

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## INTRODUCTION

Pronunciation is central to spoken communication in English: it shapes whether a speaker is understood and influences listeners' judgements of the speaker's competence. For learners of English as a foreign language, pronunciation is also one of the most difficult areas

to master, because it requires learners to perceive and produce sounds and patterns that may not exist in their first language (Gilakjani et al., 2011). For students in Indonesian vocational high schools (*Sekolah Menengah Kejuruan*, SMK), who are being prepared for workplaces in which spoken English may be required, intelligible pronunciation is a practical as well as an academic goal.

Indonesian learners face particular difficulties with English segmental sounds. Standard British English has around twenty vowel phonemes, including long–short contrasts such as /ɪ/ and /iː/ and diphthongs such as /eɪ/, /aɪ/ and /aʊ/, whereas Indonesian has a much smaller vowel inventory without length contrasts. As a result, learners often merge pairs such as *ship* and *sheep* or *bit* and *beat*. Among consonants, the dental fricatives /θ/ and /ð/ are absent from Indonesian and are commonly replaced by /t/ and /d/; a recent acoustic study of Indonesian learners found that /ð/ was the most difficult of six target consonants, pronounced accurately by only 42% of participants (Akis & Jamilah, 2025). Such substitutions can change the meaning of words and reduce intelligibility.

These difficulties were evident in the context of the present study. Preliminary observation in a Grade X class at SMKN 3 Pinrang showed that many students struggled with basic pronunciation, for example failing to distinguish *massage* from *message* or mispronouncing the diphthong in *making*. Students relied mainly on the teacher's explanations and on written texts, which do not provide models of spoken English, and they had few opportunities to practise outside class. In such contexts, the main obstacle is not only learners' first-language background but also the scarcity of accessible spoken models and structured practice.

Research on pronunciation teaching shows that instruction can make a substantial difference. A meta-analysis of 86 studies found generally large effects of pronunciation instruction, with larger gains when treatments lasted longer and included feedback (Lee et al., 2015), and a later meta-analysis showed that instruction is most effective for learners' controlled production of targeted sounds (Saito & Plonsky, 2019). Effective instruction typically combines perception and production practice (Alghazo et al., 2023; Celce-Murcia et al., 2010). However, many Indonesian classrooms offer limited access to spoken models, and teachers may lack the time or resources to provide individual pronunciation practice.

Online dictionaries offer one way of addressing this gap. Dictionaries such as the Cambridge Online Dictionary provide recorded pronunciations in British and American English together with phonemic transcriptions, and they are free and accessible on mobile phones. Studies in Indonesia and elsewhere suggest that learners value these resources and

use them for pronunciation and vocabulary. University students have reported that the online Cambridge dictionary helped their pronunciation and vocabulary (Ambarwati & Mandasari, 2020), as have users of the online Oxford dictionary (Wulansari & Fakhrurriana, 2024). The Cambridge Advanced Learner's Dictionary has been used in action research to improve junior high school students' pronunciation of /f/ and /v/ (Rini, 2016), an online dictionary has been used to teach sentence stress (Som-in et al., 2020), and a Telegram-based pronunciation dictionary improved learners' pronunciation of target words (El Sulukiyyah & Istiqomah, 2022).

These studies show that online dictionaries are promising pronunciation resources, but they leave important gaps. Most are descriptive or based on learners' perceptions, few report effect sizes, and few have examined vocational high school students, whose needs and contexts differ from those of university students. Few studies have also described how dictionary features are integrated into instruction, which makes it difficult to identify what makes dictionary-based practice useful. This study addresses these gaps by examining changes in the vowel and consonant pronunciation of vocational high school students after instruction that systematically used the Cambridge Online Dictionary, and by reporting the size of the change. It addresses the following research questions:

RQ1. What was the level of students' pronunciation of English vowels and consonants before and after instruction using the Cambridge Online Dictionary?

RQ2. Was there a statistically significant difference between students' pre-test and post-test pronunciation scores, and how large was the difference?

## LITERATURE REVIEW

### Segmental Pronunciation and EFL Learners

Pronunciation comprises segmental features, the individual vowel and consonant sounds, and suprasegmental features such as stress, rhythm and intonation (Celce-Murcia et al., 2010). Both contribute to intelligibility, but segmental errors involving high-functional-load contrasts, which distinguish many words, can seriously disrupt understanding. Learners' difficulties with segmental sounds stem largely from differences between the sound systems of their first language and English, as well as from limited exposure to spoken English, insufficient practice and low motivation (Gilakjani et al., 2011). For Indonesian learners, vowel length contrasts, diphthongs and dental fricatives are recurrent sources of difficulty (Akis & Jamilah, 2025).

Research on pronunciation teaching distinguishes perception-based instruction, which trains learners to hear differences between sounds, from production-based instruction, which trains them to articulate those sounds. Alghazo et al. (2023) found that both types improved Jordanian learners' pronunciation, with perception-based instruction producing larger gains in segmental and prosodic accuracy. Meta-analyses show that instruction focused on specific sounds produces the largest effects when gains are measured through controlled tasks such as reading aloud (Lee et al., 2015; Saito & Plonsky, 2019). These findings suggest that learners benefit from repeated exposure to clear models, explicit attention to contrasts and opportunities for controlled practice.

**Theoretical Framework**

Three strands of second language pronunciation theory frame this study. The first concerns how learners perceive new sounds. Flege's (1995) Speech Learning Model proposes that learners perceive second language sounds through the categories of their first language. Sounds that are similar to a first-language sound are often assimilated to it, so that, for Indonesian learners, English /ɪ/ and /iː/ may both be heard as Indonesian /i/. Sounds that have no close counterpart, such as /θ/ and /ð/, may be replaced by the nearest first-language sounds until learners form new categories. On this view, accurate production depends partly on accurate perception, and learners need repeated exposure to clear models that help them hear the differences between sounds.

The second strand concerns attention. Schmidt's (1990) Noticing Hypothesis holds that learners must consciously notice features of the input for those features to become intake. In pronunciation learning, learners often fail to notice contrasts that their first language does not make, even when they hear them frequently. Explicit tools that draw attention to these contrasts, such as phonemic symbols, minimal pairs and the opportunity to replay models, may therefore help learners to notice what they would otherwise miss.

The third strand concerns the goal of pronunciation instruction. Munro and Derwing (1995) distinguished intelligibility, the extent to which a listener actually understands an utterance, from comprehensibility, the listener's perception of how easy it is to understand, and from accentedness, the degree to which speech differs from a reference variety. Their work and later research suggest that instruction should prioritise features that affect intelligibility rather than the elimination of accent (Derwing & Munro, 2015). Segmental contrasts with a high functional load, such as /ɪ/–/iː/, which distinguish many common words, are therefore reasonable targets for instruction. Taken together, these strands suggest that a

dictionary-based treatment can support pronunciation learning if it provides clear perceptual models, makes target contrasts noticeable, and focuses on contrasts that matter for intelligibility.

### Online Dictionaries as Pronunciation Resources

Online learner dictionaries combine several features that are relevant to pronunciation learning. Audio recordings provide models of target pronunciations in different varieties of English, phonemic transcriptions make the relationship between spelling and sound explicit, and example sentences show words in context. From the perspective of multimedia learning, presenting auditory and visual information together can support learning when the two channels are integrated rather than redundant (Mayer, 2009). In pronunciation learning, the combination of an audio model with a phonemic symbol can help learners to notice contrasts that they cannot yet perceive reliably and to connect these contrasts with written forms.

Studies of dictionary-based pronunciation learning have produced encouraging but mostly preliminary results. Ambarwati and Mandasari (2020) found through questionnaires and interviews that university students perceived the online Cambridge dictionary as helpful for pronunciation and vocabulary, and Wulansari and Fakhrurriana (2024) reported similar perceptions of the online Oxford dictionary. Rini (2016) used the Cambridge Advanced Learner's Dictionary in two cycles of action research and found improvements in junior high school students' pronunciation of /f/ and /v/. Som-in et al. (2020) used an online dictionary to teach sentence stress to Thai university students, most of whom reached a moderate level, and El Sulukiyyah and Istiqomah (2022) developed a Telegram pronunciation dictionary that improved students' pronunciation of past-tense verbs and homophones. Together, these studies support the use of dictionaries for pronunciation practice but rely mainly on perceptions, small samples and descriptive analysis, and they rarely report effect sizes or target vocational learners.

## METHOD

**Design.** The study used a pre-experimental one-group pre-test–post-test design. This design was chosen because the school allowed access to a single intact class and because the study aimed to provide preliminary evidence of change that could justify a controlled study. The design does not include a control group and is therefore vulnerable to threats to internal validity, including maturation, testing effects (practice with the test format), regression to the

mean and history, that is, other learning experiences during the study period (Shadish et al., 2002). These threats are taken into account in the interpretation of the results.

**Table 1.** Threats to internal validity in the one-group design and how they were addressed

| Threat | Possible effect in this study | How it was addressed or acknowledged |
|---|---|---|
| Maturation | Students' English may have improved through regular lessons during the study period | The treatment period was short (four sessions); the threat is acknowledged in the interpretation |
| Testing | Familiarity with the same reading test may have raised post-test scores | Acknowledged; parallel test forms are recommended for future studies |
| Regression to the mean | Very low pre-test scores may partly rise without intervention | Acknowledged; a comparison group is recommended for future studies |
| History | Other learning experiences may have influenced pronunciation | The influence of other English learning activities during the study period is acknowledged as a potential limitation. Any concurrent instruction should be considered when interpreting the findings. |
| Instrumentation and rater bias | Scorers aware of the test occasion may have scored post-tests more generously | onsistent scoring criteria should be applied to both pre-test and post-test responses. However, potential rater bias is acknowledged if blinding and inter-rater reliability were not established. Future studies should incorporate independent raters, rater training, and inter-rater reliability checks. |

**Context and participants.** The study was conducted at SMKN 3 Pinrang, a public vocational high school in South Sulawesi, Indonesia. The participants were 17 Grade X students of the visual communication design (*Desain Komunikasi Visual*, DKV) class, selected through purposive sampling. **Instrument.** Pronunciation was measured with an oral reading test consisting of isolated words, sentences and a short descriptive text, containing target vowels (including /ɪ/–/iː/ and the diphthongs /eɪ/ and /aɪ/) and target consonants (including /θ/ and /ð/). The same test was used for the pre-test and the post-test. Students' readings were scored on a scale of 0 to 100.Scores were converted into five categories: Very Good (85–100), Good (70–84), Fair (55–69), Poor (40–54) and Very Poor (0–39).

**Treatment.** The treatment consisted of four sessions of 2 × 40 minutes. In each session, students practised vowel and consonant pronunciation using the Cambridge Online Dictionary: they listened to the British and American audio models of target words, used the phonemic (IPA) transcriptions to match symbols with sounds, and compared and practised minimal pairs such as *ship–sheep* and *bit–beat*.

**Data analysis.** Pre-test and post-test scores were summarised with descriptive statistics. Because the same students were tested twice, the difference was analysed with a

paired-samples t-test in SPSS. The mean difference, its 95% confidence interval and a within-subject effect size (Cohen's *dz*, the mean difference divided by the standard deviation of the differences) were calculated (Lakens, 2013).

## FINDINGS AND DISCUSSION

### Findings

#### *Pronunciation before and after instruction*

Before instruction, students' pronunciation was weak. The mean pre-test score was 44.06, in the Poor category. Thirteen students (76.5%) were in the Poor category and four (23.5%) in the Very Poor category, while none reached the Fair, Good or Very Good categories. Frequent errors included the merger of /ɪ/ and /iː/ (for example, *sheep* produced as *ship*), the reduction of diphthongs (for example, *make* produced as /mek/ instead of /meɪk/) and the replacement of dental fricatives with stops (for example, *think* produced as /tɪŋk/ and *this* as /dɪs/).

After four sessions of instruction, the mean post-test score was 82.47, in the Good category. Thirteen students (76.5%) were in the Good category and four (23.5%) in the Very Good category, and none remained in the Fair, Poor or Very Poor categories. Students distinguished /ɪ/ and /iː/ more consistently and produced /θ/ and /ð/ more accurately in words such as *think* and *this*. Table 1 and Figure 1 show the shift in the distribution of categories.

**Table 2.** Distribution of students' pronunciation categories in the pre-test and post-test (n = 17)

| Category | Score range | Pre-test f | Pre-test % | Post-test f | Post-test % |
|---|---|---|---|---|---|
| Very Good | 85–100 | 0 | 0.0 | 4 | 23.5 |
| Good | 70–84 | 0 | 0.0 | 13 | 76.5 |
| Fair | 55–69 | 0 | 0.0 | 0 | 0.0 |
| Poor | 40–54 | 13 | 76.5 | 0 | 0.0 |
| Very Poor | 0–39 | 4 | 23.5 | 0 | 0.0 |
| **Total** | | **17** | **100.0** | **17** | **100.0** |

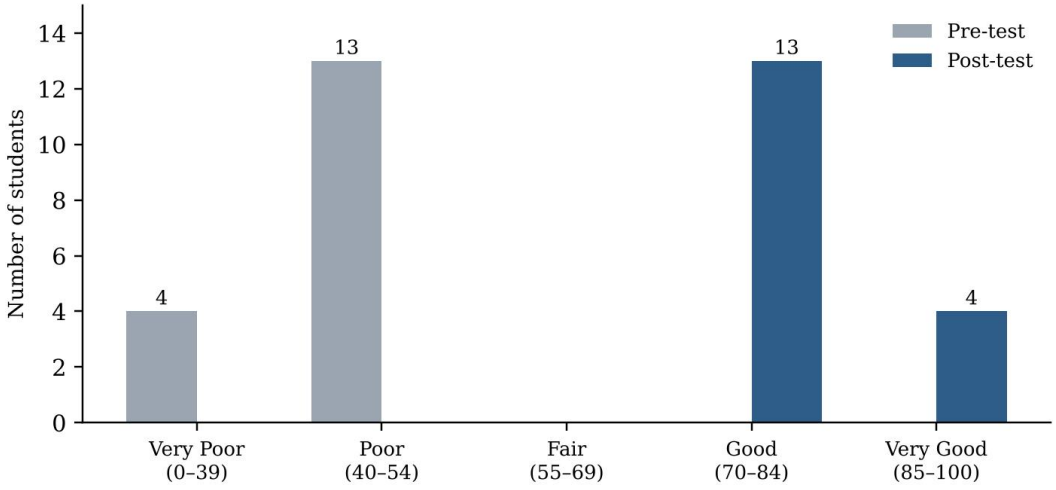



**Figure 1.** Distribution of students' pronunciation categories before and after instruction (n = 17)

### *Statistical comparison*

Table 2 presents the results of the paired-samples t-test. The mean score increased by 38.41 points, 95% CI [32.19, 44.63]. The difference was statistically significant, $t(16) = 13.10$, $p < .001$, and the within-subject effect size was large ($dz = 3.18$). The confidence interval indicates that, for this group, the true mean gain is likely to lie between about 32 and 45 points.

**Table 3.** Paired-samples t-test of pre-test and post-test pronunciation scores (n = 17)

| **Statistic** | **Pre-test** | **Post-test** |
|---|---|---|
| Mean | 44.06 | 82.47 |
| Standard deviation | 12.09 | 10,42 |
| Mean difference (post − pre) | 38.41 | |
| SD of differences | 12.09 | |
| 95% CI of the mean difference | [32.19, 44.63] | |
| *t*(16) | 13.10 | |
| *p* | < .001 | |
| Cohen's *dz* | 3.18 | |

*Note.* The SD of differences, confidence interval and *dz* were derived from the reported *t* value and mean difference.

## Discussion

The first research question concerned students' pronunciation before and after instruction. Before instruction, all students were in the two lowest categories, and their errors matched the difficulties reported for Indonesian learners: the merger of vowel length contrasts, the reduction of diphthongs and the replacement of dental fricatives (Akis & Jamilah, 2025; Gilakjani et al., 2011). After instruction, all students were in the two highest

categories. The second research question concerned the significance and size of the change. The paired-samples t-test showed a statistically significant gain with a large within-subject effect.

These results should be interpreted cautiously. The effect size of $dz = 3.18$ is considerably larger than the average within-group effect of $d = 0.89$ reported in the meta-analysis by Lee et al. (2015). Several factors may contribute to this difference. Within-subject effect sizes such as *dz* are typically larger than effect sizes based on the pooled standard deviation of the two tests. The use of the same reading test before and after instruction, scored by the researchers, may have inflated the gain through practice effects and rater expectations. Very low pre-test scores leave considerable room for improvement and make regression to the mean possible. Finally, because there was no control group, the gains cannot be separated from the effects of regular English lessons, maturation or other learning during the study period (Shadish et al., 2002). The results therefore show that students' pronunciation improved substantially during the period of dictionary-supported instruction, but they do not establish that the dictionary alone caused this improvement.

With these limitations in mind, several features of the treatment may help to explain the improvement. The dictionary's audio recordings provided clear and repeatable models of the target sounds, which students could not otherwise access easily. The phonemic transcriptions made the differences between sounds visible, linking the auditory model with a written symbol in the way that multimedia learning theory suggests can support learning (Mayer, 2009). The minimal-pair practice directed students' attention to the specific contrasts they found difficult, combining perception and production in the way that pronunciation research recommends (Alghazo et al., 2023; Celce-Murcia et al., 2010). The large gains on controlled reading tasks are also consistent with the meta-analytic finding that instruction focused on specific sounds produces its largest effects on controlled production (Saito & Plonsky, 2019). Whether these gains transfer to spontaneous speech, and whether they are maintained over time, remains to be tested.

The theoretical framework offers a further interpretation. From the perspective of the Speech Learning Model (Flege, 1995), learners who initially heard /ɪ/ and /iː/ as a single category needed exposure to clear and contrasting models before they could separate the two sounds. The dictionary's audio recordings, which students could replay as often as needed, provided exactly this kind of exposure. From the perspective of the Noticing Hypothesis (Schmidt, 1990), the phonemic symbols and minimal pairs may have made contrasts noticeable that students had previously ignored, because the written symbol signalled that

two words that sounded alike to them were in fact different. These interpretations are plausible but were not tested directly in this study, which did not measure perception separately from production.

It is also important to distinguish what the test measured from the broader goal of intelligible communication. The oral reading test measured the accuracy of target sounds in controlled tasks. Accuracy on such tasks is a necessary step towards intelligibility, but it does not guarantee that learners will be more intelligible or comprehensible in spontaneous speech (Derwing & Munro, 2015; Munro & Derwing, 1995). Meta-analytic evidence shows that pronunciation gains are typically largest on controlled tasks and smaller on spontaneous speech judged by listeners (Saito & Plonsky, 2019). The present results should therefore be understood as evidence of improved controlled production of target sounds rather than of improved overall spoken communication.

The findings are broadly consistent with previous studies of dictionary-based pronunciation learning. They extend the perception-based findings of Ambarwati and Mandasari (2020) and Wulansari and Fakhrurriana (2024) by providing test-based evidence, and they agree with the improvements in specific sounds reported by Rini (2016) and in target words by El Sulukiyyah and Istiqomah (2022). They also extend this line of research to vocational high school students and report the size of the change with a confidence interval, which previous studies rarely did. At the same time, the design of the present study shares the main weakness of much of this literature, namely the absence of a comparison group.

The dictionary's provision of both British and American recordings also deserves comment. Exposure to more than one variety may help learners to recognise that intelligible English is not tied to a single accent, which is consistent with the view that pronunciation teaching should aim at intelligibility rather than at imitation of one native model (Derwing & Munro, 2015). At the same time, two models may confuse beginning learners if differences between the varieties, such as the pronunciation of the vowel in *hot* or the presence of /r/ after vowels, are not explained. In the present study, the target contrasts were ones shared by both varieties, such as /ɪ/–/iː/ and /θ/–/ð/, which reduces this risk. Teachers who adopt this approach may nevertheless need to decide whether to present one variety as the main model or to treat both as equally acceptable, and to explain their choice to students.

Pedagogically, the findings suggest that online dictionaries can be integrated into pronunciation teaching as a structured resource rather than only as a reference tool. Teachers can select target contrasts based on learners' errors, use the audio models and transcriptions for perception training, and follow these with controlled production practice and feedback.

Because the dictionary is free and accessible on mobile phones, this approach may be particularly useful in vocational schools with limited resources, provided that students have reliable internet access.

## CONCLUSION

This study examined vocational high school students' pronunciation of English vowels and consonants before and after instruction using the Cambridge Online Dictionary. In answer to the first research question, students' pronunciation moved from the Poor and Very Poor categories (mean 44.06) to the Good and Very Good categories (mean 82.47). In answer to the second research question, the gain of 38.41 points was statistically significant and large, $t(16) = 13.10$, $p < .001$, $dz = 3.18$, 95% CI [32.19, 44.63].

For practice, the study suggests that English teachers in vocational schools can use free online dictionaries as part of a structured pronunciation routine: diagnosing students' most frequent segmental errors, selecting high-functional-load contrasts, using the audio models and phonemic transcriptions for focused listening, and following this with controlled production practice and feedback. Such a routine requires little preparation and few resources beyond students' phones and internet access, which makes it feasible in many Indonesian schools. Schools can support it by ensuring reliable connectivity, and teacher education programmes can prepare teachers to use phonemic transcription and dictionary audio as teaching tools rather than leaving dictionary use to students' own initiative.

The study contributes test-based evidence, with effect sizes, on dictionary-supported pronunciation instruction in a vocational school context and describes how dictionary features can be integrated into practice. However, the one-group design, the small purposive sample, the short treatment and the use of the same test before and after instruction mean that the improvement cannot be attributed to the dictionary alone and may be overestimated. Future research should use a quasi-experimental design with a comparison group, independent and trained raters with reported reliability, parallel test forms, delayed post-tests and spontaneous speaking tasks, and should extend the focus to suprasegmental features such as word stress and intonation.

## AI USE AND DISCLOSURE

Generative AI (Claude, Anthropic) was used to revise the manuscript in response to reviewer comments, edit the language, verify references, calculate effect sizes and confidence intervals from the reported statistics, and format the article according to the journal template.

The authors reviewed and verified all content and take full responsibility for the article. Please confirm or revise this statement.

## ETHICAL STATEMENT AND INFORMED CONSENT

The study was conducted after obtaining permission from SMKN 3 Pinrang through the school's established administrative procedures. The research objectives, procedures, and participant requirements were explained to the school authorities before data collection. Informed consent was obtained from the participating students and, where applicable, their parents or legal guardians before participation. Participation was voluntary, and the students were informed that they could withdraw from the study without academic consequences. The confidentiality and anonymity of all participants were maintained throughout the research process. Personal information was kept confidential, participants' identities were not disclosed in the research report, and the collected data were used solely for research purposes. All research procedures were carried out with due consideration for the participants' rights, privacy, and well-being.

## CRediT AUTHORSHIP CONTRIBUTION STATEMENT

- Hardiyanti: Conceptualization, Investigation, Data curation, Formal analysis, Writing – original draft.
- Yulie Asni: Supervision, Methodology, Validation, Writing – review & editing.

## CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this article. The authors have no affiliation with Cambridge University Press or the Cambridge Online Dictionary.

## DATA AVAILABILITY

The anonymised pre-test and post-test scores are available from the corresponding author on reasonable request.

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