

CHILDREN'S PRINTED WORD DATABASE

Manual & Documentation

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<http://www.essex.ac.uk/psychology/cpwd>

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Children's Printed Word Database

Overview

Stuart, Masterson, Dixon & Quinlan (1993-1996) developed a computerised database of words which appear in books for children in the first two years of primary school. This was used to develop stimuli for experimental work investigating the literacy acquisition of young children. This document describes the extension of this database to cover the first four years of primary school, and putting it onto the web for easy access.

The database will provide the academic community with an accessible database of young children's printed word vocabulary. For the first time researchers interested in the empirical investigation of the development of printed word recognition skills will have access to an up-to-date source of stimuli. This will allow stringent experimental control over variables such as word frequency, orthographic neighbourhood size and spelling-sound consistency at both grapheme-phoneme and rime levels. Teachers and other professional users of the database will be able to discover which words children need to know (and be taught) in order to read at a given level. The database will also allow the development of literature for children with reading difficulties with age-appropriate content presented in the highest frequency, earliest learnt vocabulary.

Database Description

1. Summary

The aim of the project was to construct a database of words that appear in books for children aged 5 – 9 years old. The database may be used to develop stimuli for experimental work investigating the literacy acquisition of young children. The database is fully interactive and accessible via the web.

2. Database Structure

| <i>Table Number</i> | <i>Table</i> | <i>Description</i> | <i>No. of Columns</i> |
|---------------------|-----------------------|--|-----------------------|
| 1 | CPWD_BOOKS | List of books and attributes of books | 8 |
| 2 | CPWD_FREQUENCY | Word frequency within each book | 5 |
| 3 | CPWD_ORTHO | Orthographic neighbourhood size | 3 |
| 4 | CPWD_ORTHO_NEIGHBOURS | List of words and orthographic neighbours | 3 |
| 5 | CPWD_PHONEME | List of phonemes, examples and different representations | 7 |
| 6 | CPWD_PHONO | List of words and phonetic attributes | 10 |
| 7 | CPWD_PHONO-NEIGHBOURS | List of words and phonological neighbours | 3 |
| 8 | CPWD_PUBLISHERS | List of publishers and attributes of publishers | 13 |
| 9 | CPWD_WORDS_DERIVED | List of words and word length | 3 |
| 10 | CPWD_WORDS_ROOT | List of words, word length and noun status | 4 |

Table 1. Table structure of the children's printed word database.

3. Database Diagram

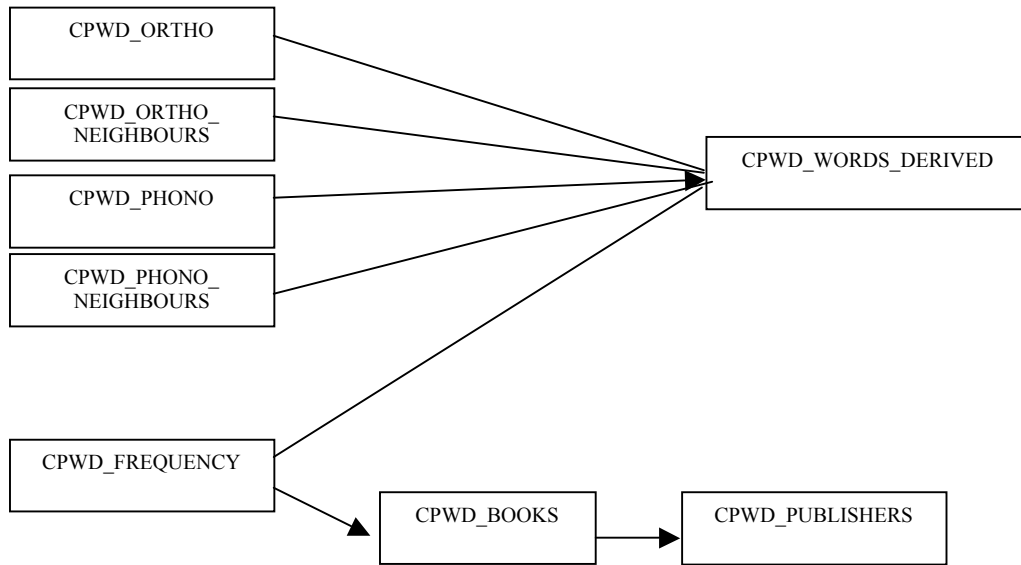


Figure 1. Database diagram for the Children's Printed Word Database

Table Descriptions

1. CPWD_BOOKS

Description

This table contains a list of all the books within the database and the attributes of these books.

Usage

This table is used to cross reference words within books.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|--|-------------|----------------|
| BKS_BOOK_ID | Unique identification number of each book | Number | 91 |
| BKS_TITLE | Title of the book | Text | Kipper's Dog |
| BKS_SCHEME | Reading scheme or series | Text | Firebird |
| BKS_READER_AGE | Year group of book | Number | 1 |
| BKS_SERIES | Series within the scheme | Text | Stage 2 |
| BKS_LEVEL | Level or stage of scheme (if appropriate) | Text | 2 |
| BKS_ISBN | ISBN | Text | 0191926596 |
| PUB_PUB_ID | Publisher's unique identification number | Number | 18 |
| InWords | Flag to show if book is recorded in database | Number | 1 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|-----------------|--|
| PUB_PUB_ID | CPWD_PUBLISHERS | Cross reference to the publisher of the book |

Notes

- **BKS_ISBN:** ISBN cannot be used as the book identification number, as some contain text and some ISBNs refer to packs of books. When searching a database, it is much faster if searching is done on numbers. Within the database, ISBNs have had all spaces, hyphens etc. removed so that all are in the same format.
- **BKS_SCHEME/BKS_LEVEL:** Level/stage will only be applicable for certain books

2. CPWD_FREQUENCY

Description

This table contains a list of the word frequencies in individual books.

Usage

This table is used to store the frequencies of words.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|---|-------------|----------------|
| BKS_BOOK_ID | Unique identification number of each book | Number | 556 |
| CWR_WORD_ID | ID number for word in root table | Number | 73 |
| FRQ_PER_BOOK | Word frequency per book | Number | 3 |
| CWD_WORD_ID | ID number for word in derived table | Number | 80 |
| FRQ_ID | Frequency ID | Number | 61465 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------------|-------------------------------------|
| BKS_BOOK_ID | CPWD_BOOK | Cross reference to the book |
| CWR_WORD_ID | CPWD_WORDS_DERIVED | Cross reference to the derived word |
| CWD_WORD_ID | CPWD_WORDS_ROOT | Cross reference to the root word |

3. CPWD_ORTHO

Description

This table contains orthographic attributes of the words within the database.

Usage

This table is used to cross reference words with their orthographic properties.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|------------------------------|--|-------------|----------------|
| WDS_WORD_ID | Unique identification number for each word | Number | 2887 |
| ORT_TOTAL_NEIGHBOURHOOD_SIZE | Total number of orthographic neighbours | Number | 8 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|-------------------|--|
| WDS_WORD_ID | CPWD_WORDS | Cross reference to the unique word identification number |

Notes

- The actual neighbourhood words will be represented in another table: ORTHO_NEIGHBOURS.
- **ORT_TOTAL_NEIGHBOURHOOD_SIZE:** replace letters of target word in turn with every other letter and count real words (excluding proper nouns)
- These are calculated based on words in the database, not an external dictionary. At present, proper nouns are excluded.

4. CPWD_ORTHO_NEIGHBOURS

Description

This table contains a list of all the orthographic neighbours for each word in the database.

Usage

This table is used to cross reference words with their orthographic neighbours.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|---|-------------|----------------|
| WDS_WORD_ID1 | Unique identification number for word | Number | 1602 |
| WDS_WORD_ID2 | Unique identification number for neighbourhood word | Number | 831 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--|
| WDS_WORD_ID1 | CPWD_WORDS | Cross reference to the unique word identification number |
| WDS_WORD_ID2 | CPWD_WORDS | Cross reference to the unique word identification number |

Notes

- This table does not contain body orthographic neighbours. These can be generated manually; please refer to the instructions on the advanced search pages.

5. CPWD_PHONEME

Description

This table contains various representations of phonemes and their correspondences.

Usage

This table is used to provide phonetic transcriptions.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|---|-------------|---------------------|
| PHN_ID | Representation of the phoneme used internally in the database | Text | :l |
| PHN_EXAMPLE | Example phoneme used in web pages | Text | ch as in chain (tS) |
| PHN_IPA | IPA representation | Text | t^ |
| PHN_MRC | Oxford Psycholinguistic Database representation | Text | tS |
| PHN_CV | Consonant/Vowel/Long Vowel | Text | C |
| PHN_DISC | DISC representation | Text | J |
| PHN_SAM_PA | SAM_PA representation | Text | tS |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--------------------|
| | | |

Notes

- The phonetic transcriptions in this database use a computer phonetic alphabet made up of two characters, developed specifically for this project. Each segment is assigned a character, a segment being a consonant, an affricate, a short vowel, a long vowel or a diphthong. Correspondences are given in the table in Appendix II. The web pages perform the conversions to SAMPA so that the transcriptions are readable.
- Other representations are included in case alternatives are required, e.g. the Oxford Psycholinguistic Database representations.

6. CPWD_PHONO

Description

This table contains phonological attributes of the words within the WORDS table.

Usage

This table is used to cross reference words with their phonological properties.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|-------------------------------|--|-------------|----------------|
| WDS_WORD_ID | Unique identification number for each word | Number | 168 |
| PHO_TRANSCRIPTION | Phonetic transcription | Text | =h={=p+i |
| PHO_SYLLABIFIED_TRANSCRIPTION | Syllabified phonetic transcription | Text | =h={=-p+i |
| PHO_PHONEME_COUNT | Number of phonemes | Number | 4 |
| PHO_SYLLABLE_COUNT | Number of syllables | Number | 2 |
| PHO_NEIGHBOUR_COUNT | Number of phonological neighbours | Number | 0 |
| PHO_STRESSED_TRANSCRIPTION | Stressed, syllabified phonetic transcription | Text | =?=h={=-p+i |
| PHO_CVPATTERN | Syllabified CV pattern of the word | Text | [CV][CV] |
| PHO_BODY_NEIGHBOUR_COUNT | Number of rime neighbours | Number | 0 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|-------------------|--|
| WDS_WORDID | CPWD_WORDS | Cross reference to the unique word identification number |

Notes

- Homophones, e.g. *sole* & *soul* count twice in neighbourhood counts
- To generate rimes, first phoneme is removed and replaced with every other phoneme. This is not used at present, and may be updated in the future so that the first segment is replaced with every other first segment (i.e. the phonemes before the first vowel sound).
- Only one phonetic transcription is available for each word, e.g. the word *the* currently has a phonetic transcription that rhymes with *me*.
- The phonetic transcriptions in this database use a computer phonetic alphabet made up of two characters, developed specifically for this project. Each segment is assigned a character, a segment being a consonant, an affricate, a short vowel, a long vowel or a diphthong. Correspondences are given in the

table in Appendix II. The web pages perform the conversions to SAMPA so that the transcriptions are readable.

7. CPWD_PHONO_NEIGHBOURS

Description

This table contains a list of all the phonological neighbours within the database, and whether or not those neighbours are also rime neighbours.

Usage

This table is used to cross reference words with their phonological neighbours.

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|--|-------------|----------------|
| WDS_WORD_ID1 | Unique identification number for each word | Number | 2752 |
| WDS_WORD_ID2 | Unique identification number for each neighbourhood word of the above word | Number | 52 |
| PHO_BODY | Flag indicating whether or not the phonological neighbour is also a rime neighbour | Number | 1 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--|
| WDS_WORD_ID1 | CPWD_WORDS | Cross reference to the unique word identification number |
| WDS_WORD_ID2 | CPWD_WORDS | Cross reference to the unique word identification number |

Notes

- Homophones, e.g. *sole* & *soul* count twice in phonological and rime neighbourhood counts

8. CPWD_PUBLISHERS

Description

This table contains a list of all the publishers of books and the attributes of these publishers

Usage

This table is used by the books table to define publishers

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|--|-------------|--------------------|
| PUB_PUB_ID | Publisher's unique identification number | Number | 11 |
| PUB_CONTACT | Name of contact at publishers | String | Steve McBride |
| PUB_TITLE | Title for contact at publishers | String | Head of Marketing |
| PUB_PUBLISHER | Name of publisher with parent company | String | Firebird |
| PUB_ADDRESS | First line of publisher's address | String | 7 Blighty Lane |
| PUB_ADDRESS1 | Second line of publisher's address | String | |
| PUB_TOWN | Publisher's town | String | Newtown |
| PUB_COUNTY | Publisher's county | String | Lancashire |
| PUB_POSTCODE | Publisher's postal code | String | LS8 5TZ |
| PUB_PHONE | Publisher's phone number | String | 0117 415 2000 |
| PUB_FAX | Publisher's fax number | String | 0117 415 2039 |
| PUB_EMAIL | Contact's email address | String | |
| PUB_URL | Web address of publisher | String | www.firebird.co.uk |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--------------------|
| NONE | | |

9. CPWD_WORDS_DERIVED

Description

This table contains a list of all the words within the database in their original format (i.e. with appropriate capitalisation) and the word lengths

Usage

This table is used to define all words within the database

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|--|-------------|----------------|
| CWD_WORD_ID | Unique identification number for each word | Number | 6557 |
| CWD_WORD | Individual word in its original form | Text | Jumpers |
| CWD_LENGTH | Length of the word | Number | 7 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--------------------|
| NONE | | |

Notes

- Every possible representation of every word within the database is defined by a number. HELLO, Hello & hello would all be represented separately in this table.
- There is no distinction between homographs. Read (infinitive) and read (past tense) are currently indistinguishable, and hence the frequencies calculated refer to both.
- Word length does not include hyphens, single quotes, numbers or any other non-alphabetic characters.
- Abbreviations are included in the database as separate individual characters.

10. CPWD_WORDS_ROOT

Description

This table contains a list of all the words within the database, their word length and whether or not they have been labelled as proper nouns

Usage

This table is used to define the lower-case form of all words within the database

Column Descriptions

| <i>Column Name</i> | <i>Description</i> | <i>Type</i> | <i>Example</i> |
|--------------------|--|-------------|----------------|
| CWR_WORD_ID | Unique identification number for each word | Number | 634 |
| CWR_WORD | Individual word | Text | pictures |
| CWR_LENGTH | Length of the word | Number | 8 |
| CWR_PNOUN | A flag indicating if the word has been labelled as a proper noun | Number | 0 |

Cross References

| <i>Column</i> | <i>Table</i> | <i>Description</i> |
|---------------|--------------|--------------------|
| NONE | | |

Notes

- In this table, there is only a single representation of each word – the lower-case representation
- There is no distinction between homographs. Read (infinitive) and read (past tense) are currently indistinguishable, and hence the frequencies calculated refer to both.
- Word length does not include hyphens, single quotes, numbers or any other non-alphabetic characters.
- Abbreviations are included in the database as separate individual characters.

Searching the Database

Overview

This document describes possible ways to search the database, and sets out the specification for the web pages designed to access the database. The project website is available at: <http://www.essex.ac.uk/psychology/cpwd> and also includes a brief history.

Search Pages

Two different types of search exist. It is possible to either generate a list of words and associated properties based upon specified criteria, or, alternatively, to use a list of words provided by the user to find out various properties of those words. In addition to the simple search pages, there are two advanced search pages, one for each type of search.

The following things are common to the search results pages:

- a time and date stamp
- a summary of the search specification
- an HTML table containing the results of the search (which can be copied and pasted into other applications)
- a link to a comma delimited file, suitable for export into other applications (this is easier than copying and pasting for very long results tables)

List Generation Pages

1. Words within a frequency range

This page allows the user to obtain a list of words within a specified frequency range. It is possible to limit this search to certain user-defined reading schemes from the list provided. Multiple schemes can be chosen. The default is all schemes in the database.

The output shows the word, and its frequency per million, defined as⁴:

$$\text{frequency per million} = \frac{\text{total frequency across books}}{\text{number of occurrences of words in database}} * 1000000$$

2. Words containing a specific group of letters

This page allows searching based upon a user-specified group of letters (from 2 – 5). The letter can appear at the start or the end of the word, or appear anywhere in the word. It is also possible to limit the search to a single word length, or a range of word lengths (e.g. from 3 – 6 letters). Pattern searching is possible e.g. all words containing a_e separated by one character, or all words containing a_e separated by any number of characters.

The output shows the word, the frequency per million⁵ and the word length.

3. Words containing a specific phoneme

This page allows searching based upon a user-specified phoneme or phoneme combination. The phoneme can appear at the start or the end of the word, or appear anywhere in the word. Using the special characters described on the page, it is also possible to use this page to search for patterns.

The output shows the word, phonetic transcription⁶, frequency per million⁷ and word length.

⁴ See Appendix I for further information.

⁵ See Appendix I for further information

⁶ please refer to Appendix II for the phonetic transcription table.

⁷ See Appendix I for further information

4. List of Orthographic Neighbours

This page allows the user to obtain the orthographic neighbours of a word or list of words (that are provided by the user).

Definition: Orthographic neighbours are generated by taking a word, and replacing each letter in turn with every other letter. The result is then compared to the rest of the database, and hence the neighbours are based on the database only. Proper nouns are excluded from the generation of neighbourhoods.

The output shows the specified word(s) and one neighbour per line, e.g.

| | |
|-----|-----|
| Cat | Cad |
| Cat | Fat |
| Cat | Hat |
| Cat | Mat |

The results are grouped by words in the original list.

5. List of Phonological Neighbours

This page allows the user to obtain the phonological neighbours of a word or list of words (provided by the user). Phonological neighbours are generated by taking a word, and replacing each phoneme in turn with every other phoneme. The result is then compared to the rest of the database, and hence the neighbours are based on the database only. Proper nouns are excluded from the generation of neighbours.

NB At present, homophones contribute to phonological neighbourhood counts, i.e. both *sole* and *soul* would appear in a list of phonological neighbours of *mole*.

The output shows the specified word(s) and one neighbour per line, e.g.

| | |
|-----|------|
| Cat | Cap |
| Cat | Fat |
| Cat | Mat |
| Cat | That |

The results are grouped by words in the original list.

User-provided List Pages

1. Word Frequencies

This page allows the user to obtain the frequencies of a word or list of words (provided by the user).

The output shows the word(s) and frequencies per million⁸, defined as:

$$\text{frequency per million} = \frac{\text{total frequency across books}}{\text{number of occurrences of words in database}} * 1000000$$

2. Orthographic Properties

This page allows the user to obtain orthographic properties for a word or list of words (provided by the user).

The output shows the word(s), the number of orthographic neighbours⁹, word length, CV structure, and frequency per million¹⁰.

3. Phonological Properties

This page allows the user to obtain phonological properties for a word or list of words (provided by the user).

The output shows the word(s), the number of phonological neighbours¹¹, the number of rime neighbours¹², the phonetic transcription¹³, the number of phonemes, the number of syllables and the frequency per million¹⁴.

⁸ See Appendix I for further information

⁹ Orthographic neighbours are generated by taking a word, and replacing each letter in turn with every other letter. The result is then compared to the rest of the database, and hence the neighbours are based on the database only. Proper nouns are excluded from the generation of neighbourhoods (where possible).

¹⁰ See Appendix I for further information

¹¹ Phonological neighbours are generated by taking a word, and replacing each phoneme in turn with every other phoneme. The result is then compared to the rest of the database, and hence the neighbours are based on the database only. Proper nouns are excluded from the generation of neighbours (where possible).

¹² Rime neighbours are generated by taking a word, and replacing the first phoneme in turn with every other phoneme. The result is then compared to the rest of the database, and hence the neighbours are based on the database only. Proper nouns are excluded from the generation of neighbours (where possible).

¹³ using the SAMPA character set; please see Appendix IV for the full correspondence table.

¹⁴ See Appendix I for further information.

Advanced Search Pages

1. Database-generated

This page allows the user to obtain a list of words based upon a range of options. It is possible to limit this search to certain reading schemes from the list provided, and by number of letters/syllables/phonemes as well as by what letters/phonemes the word contains.

The output can be chosen from a range of alternatives. For full explanations, please refer to the other search page specifications.

Body orthographic neighbours can be generated using the following instructions (also available on the web page):

-
- specify the number of syllables (using the *only words with* option)
 - specify what letters the word ends with
 - if necessary, specify which phonemes the word must contain

For example, the specification below will generate the body orthographic neighbours of *cat*

- only words with 1 syllable
 - words which end with the letter(s) at
 - words which contain a as in pat ({})
-

2. User-provided List

This page allows the user to obtain word frequencies, word length and orthographic and phonological characteristics of a word or list of words (provided by the user).

For description of the output please refer to the relevant search page specifications.

Future Developments

Overview

The Children's Printed Word Database is described extensively elsewhere in this document. This section outlines some possible future developments of the current database (with explanations where applicable).

Reading Age

It may be useful in the future to conduct a survey to obtain the reading ages of children reading the books included in the database, to allow more refined searches.

Searches

There are a range of refinements that could be implemented on the search pages. These could include sorting results by various different included measures, e.g. sorting by frequency. It would also be possible to add to the search limits, so that limiting the search by scheme is expanded to allow searching for levels within a given scheme.

At present, it is only possible to search the database for a given word, not for various representations of that word such as hello, Hello and HELLO. All the necessary information is within the database, but Access does not allow case sensitive searches. SQL, another common database package, does allow a case-sensitive search if installed in a certain way, but this is not supported at present, and a web licence for SQL Server is extremely expensive.

Another possibility would be phrase searching or punctuation searching; the database could be extended in the future to include encoded texts, which would allow searches for phrases.

Appendix I – Word Frequencies

The frequencies given are frequencies per million words, based on the following formula:

$$\text{frequency per million} = \frac{\text{total frequency across books}}{\text{number of occurrences of words in database}} * 1000000$$

At present, the database contains 369,774 occurrences of 12,452 tokens.

Appendix II – Phonetic Transcription Table

Correspondences between the IPA and SAMPA character sets, with examples, the database representation and CV representations

| example | IPA | SAMPA | DISC | database | CV |
|---------|-----|-------|------|----------|----|
| put | ɒ | p | p | =p | C |
| but | ɒ | b | b | =b | C |
| ten | ɛ | t | t | =t | C |
| den | ɛ | d | d | =d | C |
| can | ɒ | k | k | =k | C |
| game | ɒ | g | g | =g | C |
| long | ɒ | N | N | +n | C |
| man | ɒ | m | m | =m | C |
| not | ɒ | n | n | =n | C |
| like | ɒ | l | l | =l | C |
| run | ɒ | r | r | =r | C |
| full | ɒ | f | f | =f | C |
| very | ɒ | v | v | =v | C |
| thin | ɒ | T | T | +t | C |
| then | ɒ | D | D | +d | C |
| some | ɒ | s | s | =s | C |
| zeal | ɒ | z | z | =z | C |
| ship | ɒ | S | S | +s | C |
| measure | ɒ | Z | z | +z | C |
| yes | ɒ | j | j | =j | C |
| hat | ɒ | h | h | =h | C |
| went | ɒ | w | w | =w | C |
| chain | ɔɪ | tS | J | :1 | C |
| jump | ɔɪ | dZ | — | :2 | C |
| bean | ɪ | i: | i | :3 | VV |
| barn | ɔɪ | A: | # | :4 | VV |
| born | ɒ | O: | \$ | :5 | VV |

Children's Printed Word Database

| | | | | | |
|-------|-----|----|---|----|----|
| boon | □□ | u: | u | :6 | VV |
| burn | □□ | 3: | 3 | :7 | VV |
| pit | □ | I | I | +i | V |
| pet | □ | E | E | +e | V |
| pat | □ | { | { | ={ | V |
| putt | ∅ | V | V | +v | V |
| pot | | Q | Q | +q | V |
| good | □ | U | U | +u | VV |
| about | □ | @ | @ | =@ | VV |
| bay | □□ | eI | 1 | :8 | VV |
| buy | □□ | aI | 2 | :9 | VV |
| boy | □ | OI | 4 | :A | VV |
| no | □ □ | @U | 5 | :B | VV |
| now | □□ | aU | 6 | :C | VV |
| peer | □□ | I@ | 7 | :D | V |
| pair | □□ | E@ | 8 | :E | V |
| poor | □□ | U@ | 9 | :F | V |