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REVIEW OF FIVE ENGLISH LEARNERS' DICTIONARIES ON CD-ROM

Title	Platform	Minimum hardware requirements	Publisher	Support offered	Price	ISBN
Cambridge advanced learner's dictionary on CD-ROM. (2nd Ed., version 2.0a, 2005)	Windows 98, NT4, 2000, ME, or XP	300 MHz 128 MB RAM Free hard disk: 200 MB	Cambridge University Press www.cambridge.org	Brief manual attached to the disk. Guided tour	$21.07	0521604990
***Collins Cobuild advanced learner's English dictionary on CD-R4OM*. (5th Ed., 2006)**	Windows 98, 2000, ME, XP, or NT	350 MHz 64 MB RAM Free hard disk: 120 MB	Harper Collins Publishers, Ltd. www.harpercollins.com	Brief manual attached to the disk. Help menu. Phone: 44(0)1413063322	$15.94	0007210124
***Longman dictionary of contemporary English, writing assistant edition CD-ROM*. (Updated 4th Ed., 2005)**	Windows 98, NT, ME, 2000, or XP. Mac 10.2. or higher. Linux Redhat 9, Mandrake 10/10.1, Suse 9.1, Debian 3.0	350 MHz 128 MB RAM Free hard disk: 460 MB	Pearson Education, Ltd. www.pearsoned.co.uk	Brief manual attached to the disk. Guided tour. www.longman.com/dictionaries/	$64.79	9781405811286
***Macmillan English dictionary for advanced learners CD-ROM*. (2nd Ed., version 2.0.0702, 2007)**	Windows 2000 or XP	300 MHz 128 MB RAM Free hard disk: 450 MB	Macmillan Publishers, Ltd. www.macmillan.com	Brief manual attached to the disk. Guided tour. www.macmillandictionary.com	$41.48	9781405025263
***Oxford advanced learner's compass*. (7th Ed., 2005)**	Windows 98, NT, ME, 2000, or XP. Mac 10.2 or higher. Linux Redhat 9 or higher	350 MHz 128 MB RAM Free hard disk: 110 MB	Oxford University Press www.oup.co.uk	Graphic tutorial	$34.07	0194316491

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English learners' dictionaries on CD-ROM are attracting more and more attention, given the enormous potential afforded by the new technologies to enhance language description. McCorduck (1996) states that this "shows the exciting promise of the application of multimedia computer technology to lexicography and language learning" (p. 225). As an electronic resource, a dictionary on CD-ROM is based on its printed counterpart, "a synchronic monolingual dictionary intended to meet the demands of the foreign user" (Herbst, 1990, p. 1379).

This review focuses on the latest editions of five advanced learners' dictionaries of English on CD-ROM, each of which comes packaged with their printed editions. The review highlights their most outstanding characteristics and constraints and compares them over ten dimensions:

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graphical user interface, accessibility and information retrieval, macrostructure, microstructure, thesaurus-like consultation, complex searches, copy and print functions, extras, multimedia resources, and customization. The comparison also addresses the advantages of computer-aided lookup over paper-based consultation methods.

GRAPHICAL USER INTERFACE (GUI)

The GUI is a key feature of electronic dictionaries (EDs) since users expect to gain access to every function in an electronic dictionary in a simple, direct manner. A GUI is graphics-based, rather than character-based, although it reproduces the entries content of paper-based dictionaries. Consequently, GUI design may make consultation easier while extra attributes (e.g., color and clear typography) can act as psychological incentives for users. Corris, Manning, Poetsch, and Simpson (2000) note that "electronic interfaces still possess the charm of novelty" (p. 178), and this helps explain users' satisfaction with EDs and their preference for them (Nesi, 2000b).

A clear evolution is obvious in the graphical interfaces of current EDs, compared to their earlier editions: graphical innovations have been added to make the interface more modern and stylish and to enable access to menus and options easier; further links to extras have been included; and small pop-up windows have been designed for joint use of EDs with other computer applications (e.g., word processors, hypertext on the Internet, or e-mail). These elements, and others mentioned below (pop-up menus, tool bars, on-screen buttons, and dialogue boxes), add to the user-friendliness of EDs and ensure "fail-safe" lookup procedures (de Schryver, 2003, p. 182). Figures 1 through 5 in the Appendix illustrate the GUIs of the five EDs examined here, all showing the same search word, *catch*.

All five EDs have similar interfaces, although certain differences are apparent. As far as layout is concerned, three dictionaries—*Cambridge Advanced Learner's Dictionary* (henceforth *CALD2*), *Collins Cobuild Advanced Learner's English Dictionary* (*COBUILD5*), and *Macmillan English Dictionary for Advanced Learners* (*MED2*)—present a long, narrow panel on the left displaying an alphabetical index list and a results list of all entries containing the search word. This design might be more informative than the interfaces of the *Oxford Advanced Learner's Compass* (*OALD7*) and the *Longman Dictionary of Contemporary English* (*LDOCE4*), which simply include a drop-down menu next to the search box showing the search word within a limited list of words beginning with the letters keyed in. Neither of the last two dictionaries displays the full A-Z index of entries; however, *OALD7* offers a results list window showing a word in four sections: headwords, idioms, phrasal verbs, and structures.

The second element on the screen is a definition (or entry) window showing the entry for the word. The design of this window is different in each of the dictionaries. In paper dictionaries, "all the information [is presented] in a linear order on the same level (unless using different typesets or colours)" (Tono, 2000, p. 855); in contrast, three electronic dictionaries—*CALD2*, *MED2,* and *LDOCE4*—opt for the so-called "layered" presentation (p. 857). They do not display all information straightforwardly, but rather, by clicking on different tabs, the user can retrieve further details about the search word not supplied directly in the text of the definition window. This utility adds to the simplicity of entries and facilitates customization, that is, adaptation to the lookup aims of each user. In contrast, the other two EDs examined have a "traditional interface", where "information is provided in a similar way to that in a paper dictionary" (Tono, 2000, p. 856), and, hence, they reproduce the entry text of their printed counterparts accurately. As a result, the definition window is packed with information and might be a little hard to process.

Standard elements of the interface of EDs are a menu bar and a tool bar. The former includes Windows-like menus, such as File, Edit, Options, History, or Help, and is found in two dictionaries, *CALD2* and *COBUILD5*. In contrast, *MED2*, *LDOCE4* and *OALD7* opt for Tool bars of various kinds and designs, including options such as Back, Forward, Copy, Print, Paste, History, Help, and Quick Search, also used

in *CALD2* and *COBUILD5*. Tool bars may prove more user-friendly than Windows-like menus since they provide quicker, more direct access to the software utilities.

A more recent feature of the interface of these EDs is the inclusion of on-screen buttons, or tabs, which give direct access to dictionary extras, as well as to other complementary books accompanying the dictionary proper. These elements are very practical for users because, by simply clicking a button, they can easily consult other resources. Some of the EDs examined also incorporate additional components on the right-hand side of the interface. *LDOCE4* offers access to a Phrase Bank, an Examples Bank, and an Activate-Your-Language option. *OALD7* offers Word Origin, Example Sentences, and a Wordfinder tool. The interfaces of *CALD2*, *COBUILD5* and *MED2* do not contain these types of panels, and, hence, *LDOCE4* and *OALD7* can be considered superior in this regard.

From the user's point of view, all five interfaces allow quick and easy access to the desired information (see Table 1). The interfaces of *LDOCE4* and *OALD7* stand out among the others since they enable access to the largest number of dictionary extras and complementary books. *MED2* and *CALD2* are unique due to their modern, layered interface. *COBUILD5*'s interface (see Figure 2) proves rather plain in its content and visual appeal.

Table 1. Comparison of Graphical User Interface Features

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Index list panel	+	+	-	+	-
Results list panel	+	+	-	+	+
Definition window	+	+	+	+	+
Layered interface	+	-	+	+	-
Traditional interface	-	+	-	-	+
Menu bar	+	+	-	-	-
Tool bar	+	+	+	+	+
Access to complementary books	-	-	+	-	+
Extra type of panels	-	-	+	-	+

ACCESSIBILITY AND INFORMATION RETRIEVAL

EDs surpass hard copy dictionaries in their search potential. The software locates every occurrence of a word in the entire dictionary. Thus, users automatically get information about lexical items as they appear not only in main entries, but also in derived words, compounds, phrasal verbs, idioms, collocations, definitions, and examples. However, the search capabilities of the five EDs are not identical. *MED2*, *CALD2* and *COBUILD5* (in that order) offer the widest range whereas *OALD7* is slightly less informative because its simple search function locates a word only in headwords, idioms, phrasal verbs, and collocations. *LDOCE4* looks for a word only in main entries. Which search function is most practical to a given user depends on his/her needs and proficiency level. A wide search range is most useful to advanced users, researchers, and EFL teachers, who may want to seek detailed information about a lexical item as it is used in idioms, examples, collocations, or definitions. Conversely, language learners may just need to access a word in a quick manner by referring directly to its main entry.

CALD2 uses a special color code for entries, which helps users identify the type of entry appearing in the results list, e.g., headwords are displayed in dark blue, phrasal verbs in green. This feature might be particularly helpful if the user needs to identify the specific location of a search term in the text of the dictionary quickly, e.g. in a definition or in an idiomatic construction. In contrast, *OALD7* uses explicit labels (headwords, idioms, phrasal verbs, and collocations) for that purpose. This practice, typical of *OALD7*, is even more helpful to users because it is more self-explanatory. None of the other three dictionaries feature this type of color code or label convention, which makes them less user-friendly.

Accessibility is a major and distinctive attribute of EDs, realized in different word look-up methods (Corris et al., 2000). Users may key in a word in the search box, they may choose a lexical item from a word list after typing in "the first three or so letters of a word" since "the word list automatically scroll[s] down to that point", or they may locate it by means of "fuzzy spelling options" (p. 175). This last search method is made possible as a result of a very helpful feature of the five dictionaries, their spell-check function. When a word typed in the search box is spelled incorrectly, a small window is automatically activated providing the correct form, as in *COBUILD5*. The four other EDs also display other lexical items with a similar spelling. To illustrate, if the user types **assesment*, the EDs list *assessment*, *abasement*, *assortment*, *amusement*, *amazement*, and so forth. This fuzzy spelling option helps language learners retrieve words from the A-Z list when they are not certain about correct spelling and are guided merely by the way the words sound. Other instances of the flexibility of EDs as search tools are their "hyperlinking" function, "a search mechanism by which a double click on a word on screen will call up a dictionary entry for that word" (Nesi, 1999, p. 61) and instant retrieval of fixed expressions and idioms, which can be looked up with great ease.

The accessibility of the entry text in the five EDs is superior to that of print editions due to the design of the entry window. The entry word is clearly highlighted; extensive use is made of indentation in order to separate meanings, example sentences, derivatives, and so forth; spacing is generous; and use of color and fonts adds to the clarity and neatness of the text (see Figures 1 – 5). As a result, the layout of entries and their visual impression is entirely distinct from that characteristic of print editions.

Some variation among the five EDs is, nevertheless, evident in the presentation of entries. As shown in Figures 1 through 5, only *MED2* offers a comprehensive list, or menu, of the various meanings of polysemous words at the top of the definition window—e.g. *catch* (verb). This facilitates the lookup process for language learners since the whole range of uses of the word can be seen at a glance. Moreover, each of the numbered meanings provides hyperlinks to the word's definition and examples. *LDOCE4* optionally displays this type of menu by allowing the user to click on the appropriate tab on the toolbar at the top of an entry. The other EDs, like their printed versions, do not feature this element, and hence the user inevitably has to scroll through the text, which proves cumbersome at times.

Finally, access to further lexicographical information is enhanced through inclusion of a link to various online electronic dictionaries. This is a feature exclusive to *CALD2* and *MED2*. Users may thus obtain details about a word not supplied by the dictionary on CD-ROM. More specifically, in *CALD2*, users may conduct searches in various works published by Cambridge University Press, such as the *Dictionary of American English*, the *International Dictionary of Phrasal Verbs*, the *International Dictionary of Idioms*, or the *Diccionario Klett Compact Spanish-English*. In *MED2*, the link enables free access to the British and American editions of this work, as well as regular updates of new words.

Table 2. Accessibility and Information Retrieval

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Simple A-Z search in dictionary text	++++	+++	+	+++++	++
Color/label-coded results list	+	-	-	-	+
Spell-check function	+	+	+	+	+
Hyperlinking function	+	+	+	+	+
Easy-to-read entry text	+	+	+	+	+
List of meanings	-	-	+	+	-
Online dictionaries link	+	-	-	+	-

Table 2 summarizes the characteristics of the five EDS as far as accessibility and information retrieval are concerned. The first criterion in the table is satisfied by each dictionary to various degrees, so that a

gradation is established by means of one or more plus signs. On the whole, *MED2* and *CALD2* have the greatest number of accessibility and information retrieval devices.

MACROSTRUCTURE

The macrostructure of the five EDs, that is, the alphabetical list of entries, is identical to that of their printed counterparts. Moreover, the latest editions of these printed works, based on solid corpus evidence, include a large variety of newly coined terms, as well as subject-specific vocabulary, especially from the areas of science, computing, and communications technology. For example, the terms *ozone-friendly* and *neural network* are included in all five dictionaries.

However, the coverage of regional varieties of English is not uniform in the five EDs. *MED2*, *CALD2* and *OALD7* (in this order) stand out in this respect because they include words characteristic of different varieties, such as American, Australian, or Indian English, such as *anchorman* (American)*, bonzer* (Australian), or *prepone* (Indian). In contrast, regionalisms, with the exception of American English, are scarce in *LDOCE4* and *COBUILD5*. Similarly, the treatment of spoken and informal registers is much more exhaustive in *MED2*, *CALD2, OALD7*, and *LDOCE4* than in *COBUILD5*. For example, the terms *nohow, irregardless, foul something up, allnighter,* and *argy-bargy* are included only in the former four dictionaries. Representative coverage of regionalisms and register differences adds to the usefulness of a learner's dictionary for decoding purposes.

Interestingly, *CALD2* has maintained an approach characteristic of the first and second editions of its printed versions: the different meanings of polysemous words are described in separate entries. For example, the noun *line* is described in fifteen different entries, and its derivative *line* (verb) appears three times under specific meanings of its noun. Similarly, the description of very common functional words, e.g., *in, off*, and lexical ones, e.g., *go, put*, requires a very large number of entries. For example, the verb *go* itself (not its use in a phrasal verb) is described in twenty-six different entries accompanied by semantic indications such as *move, leave, become, weaken,* and *happen.* This proliferation of entries may be a serious obstacle for users interested in one particular meaning of a word because, instead of finding all the information at a glance within the same entry, users will have to scroll down on the screen. Another unfortunate consequence of this practice is that the pronunciation and irregular forms (in the case of verbs) of words are repeated in every single occurrence of each entry (Rizo-Rodríguez, 2005).

On a positive note, the normal macrostructure of the printed edition of *LDOCE4* is interspersed with 9,000 encyclopaedic entries taken from the *Longman Dictionary of English Language and Culture* (2nd revised edition, 1999). Similarly, the alphabetical list of *OALD7* words is supplemented with 10,000 cultural entries from the *Oxford Guide to British and American Culture* (1999). This is particularly advantageous because learners can gain access not only to the core vocabulary of English, as is expected in a learner's dictionary, but also to a significant number of terms (typical of an encyclopaedia) which may enrich their background and cultural knowledge.

Table 3. Macrostructure

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
A-Z list of entries: Identical to printed edition	+	+	-	+	-
Regional varieties of English	++++	+	++	+++++	+++
Spoken and informal registers	+++	++	+++	+++	+++
Addition of encyclopaedic entries	-	-	+	-	+

Table 3 depicts the macrostructure features of the five EDs. Two or more plus signs indicate differences in coverage. Accordingly, *MED2*, *CALD2* and *OALD7*'s A-Z list of entries is rather representative of the different uses and varieties of the English language compared to *LDOCE4* and *COBUILD5*. Besides, the inclusion of encyclopaedic entries in *LDOCE4* and *OALD7* constitutes a significant addition to the macrostructure of their printed counterparts. In contrast, *CALD2, COBUILD5*, and *MED2* are still heavily dependent on the A-Z list of their printed editions, an obvious shortcoming.

MICROSTRUCTURE

The microstructures of the five EDs, that is, the content of entries, are exact replicas of their hard-copy versions. Two dictionaries, *COBUILD5* and *OALD7*, opt for the so-called traditional interface, which faithfully reproduces the entry text of the book. In contrast, the microstructure of *CALD2*, *MED2,* and *LDOCE4* exhibits a layered presentation which permits users to select extra details not supplied directly in the definition window. As a result, entries are less compact and users can customize their searches (see Table 4).

The entry window in *CALD2* displays links to pictures, study pages, and terms related to the target word, as well as the on-screen buttons: Smart Thesaurus, Word Building, Verb Endings, Extra Examples, Collocations, Common Learner Errors, and Usage Notes. Both the links and the notes on Collocations, Common Learner Errors, and Usage are appended to respective entries in the printed version, but the other buttons supply additional information found only in the electronic version. Similarly, *MED2* includes different tabs in some entries—Am/BrE Differences, Animations, Avoiding Offense, Collocations, Cultural Notes, Exercises, Expressing Yourself, Get-It-Right Notes, Illustrations, Metaphors, Sound Effects, Synonyms, Usage Notes, Weblinks, Word Sets, and Word Stories. All of these, except Exercises, Sound Effects, and Weblinks, also form part of the print dictionary. Moreover, every meaning of an entry on the CD-ROM is connected to a thesaurus button, and entries for verbs, nouns, and adjectives include an Inflections button which can be clicked to get the inflected forms.

LDOCE4 includes a toolbar showing extra details about a lexical item: Pronunciation, Menu, Word Family, Word Origin, Verb Forms, Word Sets, and Frequency of Use. These details, except the last, are available only in the electronic version, which has maintained three features of the hard-copy edition—Word Choice, Word Focus, and Collocations—by appending them to some entries. Finally, *OALD7* supplements entry information with the addition of three small panels (exclusive to the CD-ROM): Word Origin, Example Sentences, and Wordfinder.

On the whole, as Table 4 illustrates, the microstructure of *LDOCE4* offers the largest number of extras, as compared with its paper-based edition, while *COBUILD5* contains the least amount of extra information. This variety of supplements adds to the usefulness of an ED since they are intended to complete the description of a search term. Users can thus obtain a wealth of information about a word, and this extra knowledge may significantly contribute to enhancing their command of the language.

Table 4. Microstructure

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Traditional presentation of entry text	-	+	-	-	+
Layered presentation of entry text	+	-	+	+	-
Extra information	+	-	+	+	+

THESAURUS-LIKE CONSULTATION

Four EDs—*CALD2*, *MED2*, *LDOCE4,* and *OALD7*—feature thesaurus-like "onomasiological" resources not furnished by their book counterparts, apart from their A-Z "semasiological" dictionaries (Rizo-Rodríguez, 2004, p. 37). Every meaning of a word in *CALD2* is accompanied by a button which opens up

a Smart Thesaurus, whose internal semantic typology of concepts, drawn up very much in the style of *Roget's Thesaurus of English Words and Phrases* (150th anniversary edition, 2002), though less exhaustive, constitutes the basis of a very detailed onomasiological classification of English words that proceeds from concepts to words (Rizo-Rodríguez, 2004). The Smart Thesaurus utility in *CALD2* is perfectly integrated with the A-Z list, so that the user can obtain a large variety of expressions semantically related to each meaning of a search word, as well as definitions and examples. Finally, the user can consult an index to the Smart Thesaurus categories for words classified in related categories.

The second edition of *MED* also includes a Thesaurus that supplies synonyms, antonyms, related words, and their definitions next to every meaning of a word. Conceptual categories semantically associated with a search word can be looked up, but they are not organized into an index. Another shortcoming of this Thesaurus is that it can only be consulted jointly with the A-Z dictionary, not as an independent resource.

LDOCE4 features the *Longman Language Activator* (2nd edition, 2002). Conceived as a production dictionary, the *Activator* organizes vocabulary around 866 key words denoting basic concepts, which in turn are expressed by more specific lexical items. The internal organization of the *Activator* is alphabetical with each particular word explained and illustrated. Users can refer to this onomasiological dictionary separately or can browse through it in conjunction with the A-Z dictionary.

Similarly, *OALD7* incorporates the *Oxford Learner's Wordfinder Dictionary* (1997), an onomasiological lexicon which classifies vocabulary into 630 keywords in alphabetical order. Each of these semantic spheres comprises semantically related subareas and their corresponding terms, all of them accompanied by a definition and example sentences, as in the *Activator*. The *Wordfinder* is available as an independent resource on this compact disk, or it can be looked up in combination with the A-Z dictionary.

In summary (see Table 5), the most complete onomasiological information is found in *CALD2*, whose Smart Thesaurus is easy to use. Equally accessible is *LDOCE4*'s *Activator*, another excellent source of terms semantically related to a search word. *OALD7*'s *Wordfinder* is clearly inferior in coverage to the *Activator* since it targets intermediate learners. *MED2*'s Thesaurus is a user-friendly tool, but, as explained above, it has some limitations. Finally, *COBUILD5* does not include thesaurus resources. Instead, many of its entries list synonyms and antonyms of a search word; however, the electronic version contains a higher number of these types of terms than its printed edition.

Table 5. Thesaurus-Like Consultation

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Thesaurus-like resources	+	-	+	+	+
Definition of related words	+	-	+	+	+
Exemplification of related words	+	-	+	-	+
Index of semantic categories	+	-	-	-	-
Alphabetical organization of concepts	-	-	+	-	+
Thesaurus as independent resource	+	-	+	-	+

COMPLEX SEARCHES

A feature exclusive to EDs is their capacity to carry out complex word searches in a manner that exceeds the capabilities of the most meticulous paper-based dictionary user. It is one of the clearest indications of the potential of EDs as language learning/teaching tools. Only four of the EDs examined incorporate an advanced function that allows users to carry out complex lexical searches: *CALD2*, *LDOCE4*, *MED2* and *OALD7* (see Table 6). In order to compensate for the absence of this function, *COBUILD5* enables users to conduct two extra searches: a phonetic search (e.g., by entering the word *rite*, one obtains *rite*, *right* and *write*) and a morphological search (e.g., the program gives the singular form of an irregular plural noun keyed in (e.g., *mouse*, *mice*) or the bare infinitive of any inflected verbal form (e.g., *lie*, *lying*)).

Three of the EDs, *CALD2*, *MED2* and *LDOCE4*, possess an elaborate system of filters for customizing complex searches. For example, users can look for all the adverbs ending in *–ly*, all the verbs followed by a *that*-clause, or all the Spanish loan words. While the search window of each of these EDs shows its own distinctive design, the searching mechanisms are similar. They are based on filters and are graphically displayed in a dialog box where the filters are conveniently organized and ready to be selected individually or in combination with others. Searches can be conducted by entering a word in an appropriate box and by selecting one or more filters. The software then looks for that word according to the conditions established by the filters selected.

For instance, in *CALD2*, after entering the word *get* and marking the option *Linking verb* in the grammar filter, the software identifies only the copulative uses of that verb. Alternatively, a search can be launched simply by selecting some of the filters. In that case, the program returns all the words in the dictionary that match the filter criteria. For example, in *MED2*, by choosing the option *Australian* in the filter *Region*, the user obtains all the terms registered in this dictionary typically used in that variety of English. From the user's perspective, these sophisticated searching mechanisms exceed the demands of the average learner, who will not normally make use of them. However, these tools do serve the needs of the EFL teacher or the language researcher concerned with the description of English or the retrieval of very specific linguistic data which can be used in the classroom.

MED2 and *CALD2*'s search systems are quite exhaustive. They include six filters: part of speech, grammar, region, style (or usage), frequency, and subject (or topic). *CALD2* is more meticulous than *MED2* in its grammar filters. It includes refined options, such as "+ two objects", "+ object + to-infinitive" for the description of verb complementation patterns. Conversely, the region filter is clearly more specific in *MED2* (e.g., Indian, New Zealand, Scottish, and Irish English) than in *CALD2* (which includes only American English, British English, and Other Regions).

In contrast, *LDOCE4* has only three filters—frequency, part of speech, and style— but it features its own original types of searches for multimedia additions, word origin, subject, and pronunciation. *Multimedia*, like *MED2*'s *Extra Features Search*, locates all the terms that are accompanied by illustrations or sound effects in the dictionary. *Word Origin* returns lexical borrowings that entered English and classifies them by century. *Subject search* finds terms specific to a discipline. Finally, *pronunciation* locates all the words containing a sequence of phonemes, and, hence, it is useful in locating words whose exact spelling is not known, or in retrieving homophones and words that rhyme. *MED2* and *COBUILD5*, unlike *CALD2* and *OALD7*, possess identical pronunciation functions.

In contrast, the advanced search utility in the *Oxford Advanced Learner's Dictionary* is quite different. Searches have to be conducted within a blank window without the help of any filter menus. Instead, searches require the use of specific labels listed in the advanced search window. After a test of this system, it was found that it is in need of substantial revision and simplification, mainly because queries must be formulated in a syntax barely explained in the Help menu, and also because many of the labels are, unfortunately, interpreted literally by the software. For example, after keying in the label "computing", the user does not only retrieve terms relative to this discipline, but rather all the occurrences of this lexical unit in the dictionary text.

Finally, advanced searches can be formulated with the help of wild cards: the symbols *?* (standing for one letter) and * (standing for zero or more letters) and Boolean operators *AND, OR,* and *BUT*. This is possible only in *MED2*, *LDOCE4* and *OALD7*. This sophisticated tool can be exploited by EFL teachers to obtain supplementary classroom materials. For instance, by typing in *will* / *would* AND *if*, teachers can retrieve a large number of examples of conditional sentences. Similarly, language researchers may want to expand the scope of a search in order to look for certain types of lexical items. The search *NOUN:*ee* returns all the nouns ending in *–ee* recorded in the dictionary.

On the whole, *MED2* has the most powerful advanced search instrument. *CALD2* and *LDOCE4*'s are also very efficient. The three of them, unlike *OALD7*, are equipped with an elaborate system of filters which simplify searches. In contrast, the advanced search function of *OALD7* is extremely intricate and actually hinders complex searches while *COBUILD5* does not incorporate this utility at all.

Table 6. Complex Searches

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Advanced search function	+	-	+	+	+
Filter system	+	-	+	+	-
Pronunciation search	-	+	+	+	-
Wild cards search	+	-	+	+	+
Boolean operators search	-	-	+	+	+

COPY AND PRINT FUNCTIONS

Much of the usefulness of the results obtained with the advanced search function described above resides in their readiness to be exported to a word processor. The copy and print functions will be particularly appreciated by EFL teachers and language researchers, who can easily employ the results furnished by the sophisticated search mechanism. *CALD2* and *MED2* can be successfully exploited for this purpose. With *CALD2*, both the hits listed in the results window after performing a normal search and those appearing in the advanced search window can be copied (up to 1,000 hits) or printed. *MED2* also permits copying, printing, and saving with the advanced search utility (up to 200 hits). The other dictionaries, however, fall short in this respect. *LDOCE4* and *OALD7's* complex search results cannot be copied or printed at all. This is a shortcoming which significantly lessens the utility of the advanced search mechanism.

Another restriction of *OALD7* is that the text from the Word Origin window and the content of the Example Sentences window cannot be exported or printed. In contrast, *COBUILD5*'s Wordbank, *LDOCE4*'s Examples Bank and Phrase Bank, and *MED2*'s extra examples can be copied or printed, while those in *CALD2* can only be printed. Moreover, *COBUILD5* and *MED2* are the only dictionaries reviewed which allow copying of a complete entry without altering its text properties (font, color, phonological transcription, indentation, spacing) so that it can be used for teaching purposes after pasting it into a word processor document. The other EDs can copy an entry but turn it into unformatted, plain text.

To conclude, as shown in Table 7, as far as the handling and export of search results and dictionary text are concerned, the best dictionaries are *MED2* and *CALD2*. *COBUILD5* and *LDOCE4* are less flexible, and *OALD7* is deficient in this regard.

Table 7. Copy and Print Functions

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Powerful copy facility	+	-	-	+	-
Copying and printing results list items	+	-	-	-	-
Copying and printing advanced search hits	+	-	-	+	-
Copying extra examples	-	+	+	+	-
Printing extra examples	+	+	+	+	-
Copying entry text without alterations	-	+	-	+	-

EXTRAS

The latest versions of EDs all contain a number of extra features to cater to users' different needs. According to Varantola (2002), "the future dictionary is […] an integrated tool or a number of tools in a professional user's toolbox where it coexists with other language technology products such as encyclopedic [sic] sources of reference, different types of corpora, corpus analysis tools" (p. 35). However, an ED should not just be a mere amalgam of extra materials (Nesi, 2000a); instead, "there is need for 'multi-referencing': for simultaneous signalling to the user that the same query item is to be found in a number of different resources" (Leech & Nesi, 1999, p. 301). An examination of the five EDs under review reveals that four of them—*LDOCE4*, *OALD7*, *MED2,* and *CALD2*—stand out in terms of their extras (see Table 8).

Both *LDOCE4* and *OALD7* are collections of reference books: the former includes the text of its printed counterpart as well as the *Longman Language Activator*. Similarly, *OALD7* comprises the 7th edition of its printed version, *The Oxford Guide to British and American Culture* (1999), *The Oxford Learner's Wordfinder Dictionary* (1997), and also *Oxford Genie*. All these books work in perfect conjunction, as advocated by Leech & Nesi (1999), and guarantee multi-referencing. The other three EDs do not include further reference works.

An exclusive feature of *OALD7* is its Word Origin window that furnishes etymological information on 20,000 words. *LDOCE4* is notable for its Phrase Bank (a vast collection of phrases containing the search word and collocates used with the entry word, all of them illustrated with additional examples), its lesson plans for teachers (a mixture of notes for teachers and language activities intended to promote familiarization with the dictionary and its use), and its grammar section (an appendix offering brief summaries of various grammar points). All these extra elements constitute "evidence of pedagogical design and consideration of the learners' needs" (Seedhouse, 1997, p. 63). They will benefit the advanced user who wants to obtain further details about a search term and also the teacher concerned with promoting dictionary skills.

A similar attempt on the part of *LDOCE4*, *OALD7*, *CALD2* and *MED2* to serve those needs is the inclusion of a writing assistant. But the capabilities of this tool are not identical in the four EDs. The most practical writing assistant is that of *LDOCE4*. It provides thesaurus-like details and diverse grammatical information, as well as typical learner mistakes and their correct versions. In contrast, it is questionable whether the *Know-how* utility in *OALD7* is equally useful for every user. Learners must type a sentence in order to check its acceptability against various example sentences, but the effectiveness of this resource ultimately depends on the users' ability to infer grammatical information from linguistic chunks. Despite its name, *CALD2*'s *Superwrite* is not a genuine writing assistant since it simply displays any word in a text pointed at with the cursor with its complete entry. Finally, *MED2* does not feature a writing assistant proper either, but its sections *Improve Your Writing Skills* and *Expand Your Vocabulary* offer appendix-like explanations on a number of communicative functions and expressions accompanied by interactive writing exercises.

Additional extra features are *MED2*'s language awareness articles (fourteen contributions by leading specialists on idioms, metaphors, pragmatics, or word formation), its atlas featuring geographical information, and its links to websites offering cultural and encyclopaedic information. Similarly, *CALD2* contains study pages about grammar, vocabulary, and pronunciation. These will all be helpful to language learners, who can easily access and use these resources through on-screen buttons.

LDOCE4, *CALD2*, *OALD7,* and *MED2* also provide a large variety of exercises (accompanied by both check-answer and show-answer buttons) intended for upper intermediate and advanced level learners of English. *LDOCE4* offers the widest range on grammar, vocabulary, culture, listening comprehension, intonation, sentence dictation, and word dictation. *OALD7* incorporates a variety of vocabulary exercises, as does *CALD2*, which additionally includes grammar exercises. Finally, *MED2* features lexical and

grammatical activities, matching *Get-It-Right* explanatory notes on typical learner errors (appended to 104 entries) as well as writing exercises. Moreover, *LDOCE4*, *CALD2,* and *OALD7* include exam papers from a variety of language certificates, e.g., Certificate of Proficiency in English, Test of English for International Communication, or Business English Certificate, which should be useful especially for advanced learners of English preparing for these examinations.

Another outstanding feature of the latest editions of EDs on CD-ROM is the inclusion of extra examples, or small language corpora, a component metalexicographers find useful (de Schryver, 2003; Svartvik, 1999) as they provide ample evidence of language use. This will prove most advantageous for encoding tasks, mainly writing, and also for teaching purposes. Four of the EDs feature this component, but to different degrees (indicated in Table 8 by means of multiple plus signs). *COBUILD5* stands out with its Wordbank, a 5-million-word representative sample of British and American English, both written and spoken. Likewise, *LDOCE4*'s Examples Bank window offers a wealth of example sentences (76,000 from other dictionaries published by Longman and over one million examples from the *Longman Corpus Network*, http://www.longman.com/ldoce/about_cd.html). *OALD7* contains 200,000 extra example sentences (http://www.oup.com/elt/catalogue/isbn/6712?cc=es&sk=19676491). These examples have been taken from the entire text of the dictionary, as is the case with *MED2*'s Example Sentence search. Finally, *CALD2* gives just five extra examples, apart from those included in the entry itself, for the most important words, marked with the symbols E(ssential), I(mprover), and A(dvanced).

Finally, *CALD2*, *MED2,* and *LDOCE4* feature a Guided Tour of the dictionary. The first two are particularly effective because their tutorials are actual videos combining animation and narration. *OALD7* has a graphic tutorial, and *COBUILD5* offers a Help menu. This type of graphical element is in line with our present-day predominantly visual culture nowadays as it may help learners to quickly become familiar with the content and use of the dictionary. In contrast, a typical traditional paper dictionary merely includes an introduction and a brief key to its entries, which proves much less user-friendly than a visual tutorial.

In brief, *LDOCE4* is the most outstanding dictionary in terms of the usefulness of its extras (Table 8). *MED2*, *CALD2,* and *OALD7* are also characterized by the inclusion of abundant supplementary materials, and *COBUILD5* exceeds the others only with its Wordbank.

Table 8. Extras

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Multi-referencing	+	+	+	+	+
CD-ROM as collection of reference books	-	-	+	-	+
Etymological information	-	-	-	-	+
Phrase and collocations bank	-	-	+	-	-
Lesson plans for teachers	-	-	+	-	-
Grammar section	+	-	+	+	-
Writing assistant	+	-	+	+	+
Language awareness articles	-	-	-	+	-
Atlas	-	-	-	+	-
Weblinks	-	-	-	+	-
Study pages	+	-	-	-	-
Language exercises	+	-	+	+	+
Exam practice	+	-	+	-	+
Extra examples	+	+++++	+++	++	++++
Guided tour	+	-	+	+	-

MULTIMEDIA RESOURCES

A distinctive feature of EDs is their integration of various kinds of multimedia resources (see Table 9). The five dictionaries offer both American and British English recorded pronunciation of each entry, as well as pronunciation practice. In *LDOCE4*, even example sentences are accompanied by recordings, and users can practice reading them aloud and comparing their pronunciation to that of the original. This ED, like *MED2*, also features the inclusion of recordings of some musical instruments and of onomatopoeic verbs and nouns denoting types of sounds difficult to define (e.g. *bleat, chirp*). Moreover, all of the EDs, except *OALD7*, include an option for "automatic pronunciation replay" or "always play pronunciation/sound," which activates the recorded sound of every word keyed in the search box. These types of multimedia resources add to the usefulness of an electronic dictionary, since exposure to the spoken language is always beneficial for language acquisition (Brown & Yule, 1983).

Interestingly, video clips are no longer included in the latest EDs, except in *MED2*, whose animation videos illustrate hard to define verbs or nouns (e.g. *juggle*, *lob*). Earlier works, such as the *Longman Interactive English Dictionary* (2nd edition, 2000) and the *Oxford Advanced Learner's CD-ROM Dictionary* (6th edition, 2000), made use of video clips. This feature might have been eliminated from the majority of the EDs in order to save space on the CD-ROM and to give priority to the type of original extras discussed above, which may prove more informative to users.

As far as illustrations or pictures are concerned, images and color also play a prominent role in the EDs examined, except in *COBUILD5*. *LDOCE4* uses illustrations and photographs exclusively to support the definition of certain terms and, hence, they form an integral part of the entries. In *CALD2*, pictures are presented in an appendix accessed by means of an on-screen button, and they serve to enrich lexical description by grouping illustrations of semantically related terms (for example, *in the office*). In *MED2*, illustrations accompany some entries, or alternatively, they can be viewed separately as members of a list. Finally, in *OALD7* users have no direct access to pictures, which accompany only some entries in a small window, but illustrations labelled *expand* open in a larger window depicting items semantically associated (for example, *vegetables*).

MED2 and *LDOCE4* are the only EDs whose complete list of illustrations and photographs can be retrieved by means of the advanced search mode. This might be helpful for teaching purposes in order to present semantically related vocabulary. In addition, the pictures in *CALD2* and *MED2* can be rendered interactive through "hot spots": by holding the cursor over some parts of a drawing, users can activate terms denoting items in a picture. In contrast, in *LDOCE4* and *OALD7*, illustrations include labels denoting specific vocabulary.

All in all, multimedia resources are abundant in *MED2* and *LDOCE4* but not in the other EDs examined.

Table 9. Multimedia Resources

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Recorded pronunciation	+	+	+	+	+
Recorded example sentences	-	-	+	-	-
Sound effects	-	-	+	+	-
Automatic pronunciation replay	+	+	+	+	-
Animation videos	-	-	-	+	-
Illustrations appended to entries	-	-	+	+	+
Illustrations in appendix	+	-	-	+	+

CUSTOMIZATION

One recurrent demand from metalexicographers is that EDs should allow customization in terms of the lookup aims of particular users (Atkins, 2002; Corris et al., 2000; de Schryver, 2003; Varantola, 2002).

The five examined EDs allow some degree of customization (see Table 10). Interactivity, a feature of the advanced search mode, is typical of all the dictionaries except *COBUILD5*. Users can carry out complex searches according to their individual reference needs. Customization and flexibility are also evident in the layered presentation characteristic of the graphical interface of *CALD2*, *MED2,* and *LDOCE4*. This ensures that users can decide what type of information is of interest to them.

Other customization elements are restricted to the display style of entries on the screen and recorded pronunciation. All dictionaries offer very similar alternatives: selection of font size, American or British English pronunciation, and display options (e.g., phonetic transcription, grammar labels, spell check, and quick/full view). *MED2* also features an annotation facility, which allows users to add personal notes to any entry. For example, a translation equivalent or a list of synonyms previously retrieved with the advanced search function can be permanently appended to an entry and, afterwards, they can be edited or removed. *COBUILD5* allows customization through its "My Dictionary" function, which enables the creation of a personal lexicon. On the whole, the five EDs offer very similar customization options.

Table 10. Customization

	CALD2	***COBUILD5***	***LDOCE4***	***MED2***	***OALD7***
Interactive advanced search	+	-	+	+	+
On-screen buttons access to specific information	+	-	+	+	-
Display style options	+	+	+	+	+
Full / compact entry view	-	+	-	+	-
Annotation facility	-	-	-	+	-
Personal lexicon	-	+	-	-	-

SUMMARY

Based on the preceding comparison of five EDs several conclusions may be drawn. The electronic versions of these works are superior to their hard-copy counterparts in terms of accessibility and flexibility of information retrieval (enhanced by their graphical user interface), wider macrostructure (in some EDs), more detailed microstructure, thesaurus-like resources, complex search mechanisms, copy and print functions, extra components, multimedia resources, and the degree of customization. Additionally, the comparison shows that all EDs are equally easily accessible to users and that they all provide a large variety of lookup operations. At a more specific level, however, the preceding analysis suggests that *MED2* ranks highest because it exhibits the largest number of functions and innovative features. It is closely followed by *LDOCE4* and *CALD2*. *OALD7* also possesses a large number of valuable features, while *COBUILD5* is the most basic. In particular, *MED2*, *LDOCE4*, *CALD2,* and *OALD7* stand out due to their modern graphical interface, addition of entries from other reference books (*LDOCE4* and *OALD7*), supplementary information in their entries, inclusion of abundant thesaurus-like information, powerful search utilities (*MED2* and *CALD2*), excellent copy and print functions (*MED2* and *CALD2*), high number of extra elements, recorded pronunciation and practice of every example sentence (*LDOCE4*), and layered presentation of content (*CALD2*, *MED2,* and *LDOCE4*).

Nevertheless, this comparison has also exposed some weak points in the EDs. For example, the macrostructure of *COBUILD5, CALD2,* and *MED2* merely reproduces that of their hard-copy counterparts; *LDOCE4*'s dictionary search function proves insufficient for retrieving very specific types of language data (it consists of only three filters); and *OALD7*'s search function (non-filter based) would benefit from revision and simplification. In addition, all dictionaries, except *MED2* and *CALD2*, which already possess it, should incorporate a flexible, unrestricted copy and print function in order to help users utilize the findings of the advanced search function. Furthermore, a first-rate attribute of *LDOCE4* – its

recorded pronunciation and sentence practice functions – might well be a "must" in subsequent editions of other EDs as they facilitate exposure to the spoken language. Furthermore, these dictionaries might also look toward including instrumental animated videos featured by *MED2* since they facilitate learning of words that defy semantic description. Finally, the EDs might benefit from extending customization features to suit users' reference needs. These additions would result in more efficient, powerful language tools that meet the increasing demands of learners, teachers, and metalexicographers.

Finally, although the macrostructure and microstructure of these electronic works depend to a considerable extent on those of their printed versions, these EDs also possess properties which set them apart from paper dictionaries and which make them very effective. The present survey of ED features has shown that significant moves are being made by lexicographers and publishers to produce versatile, multipurpose electronic dictionaries that clearly surpass their printed editions.

APPENDIX

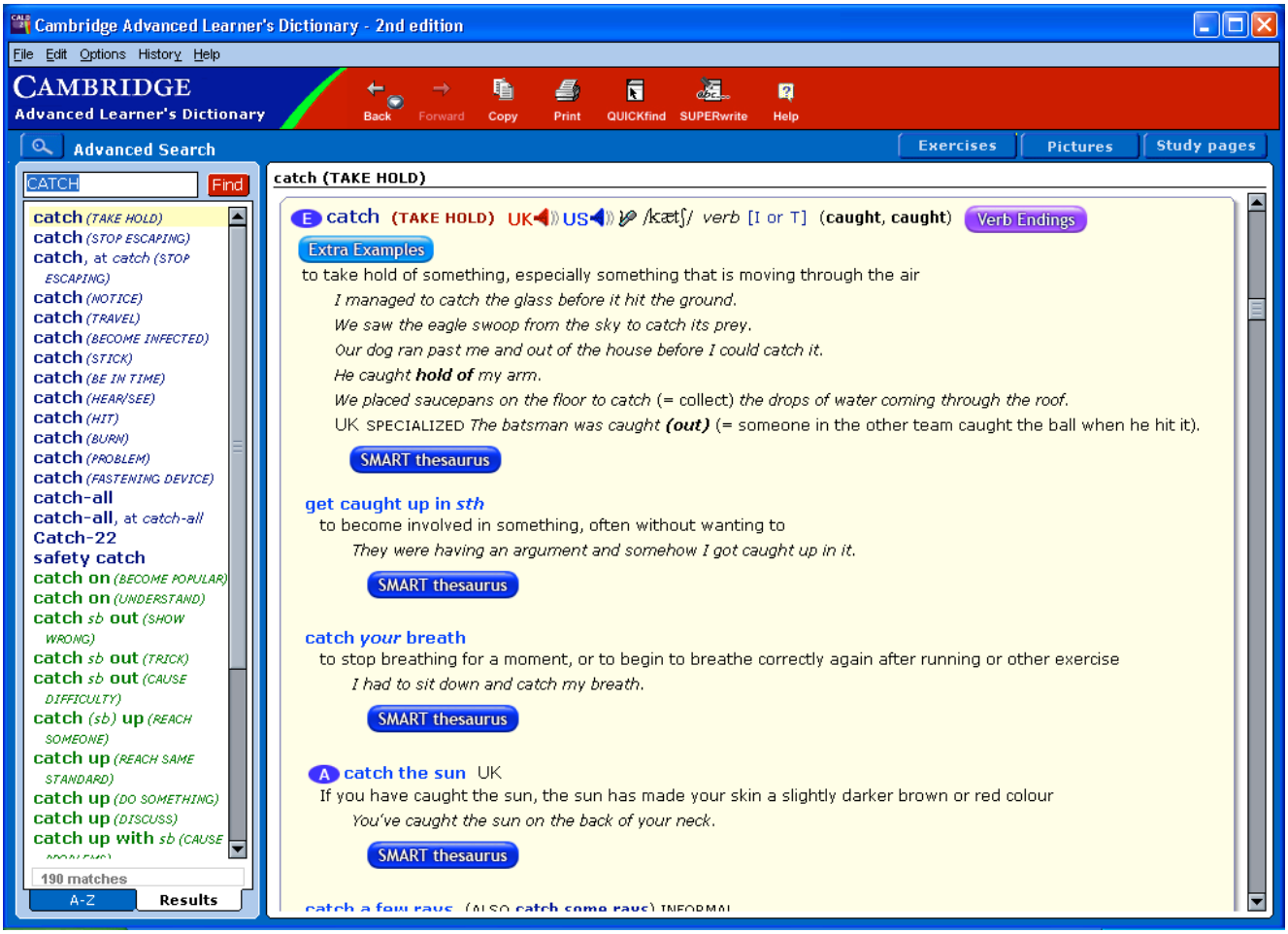

Figure 1. Cambridge advanced learner's dictionary on CD-ROM (2nd Ed., 2005)

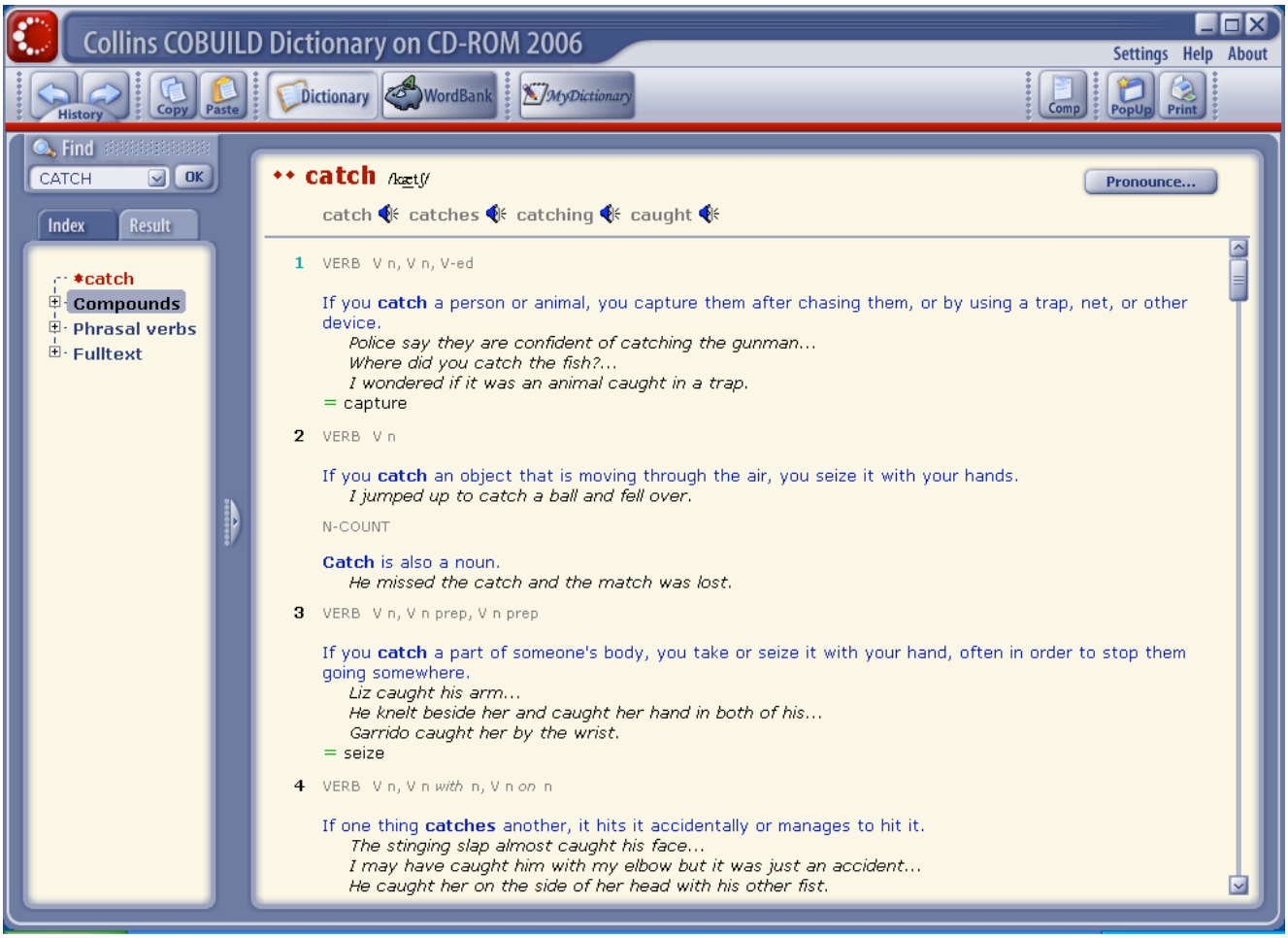

Figure 2. Collins Cobuild advanced learner's English dictionary on CD-ROM (5th Ed., 2006)

Figure 3. Longman dictionary of contemporary English, writing assistant edition CD-ROM (Updated 4th Ed., 2005)

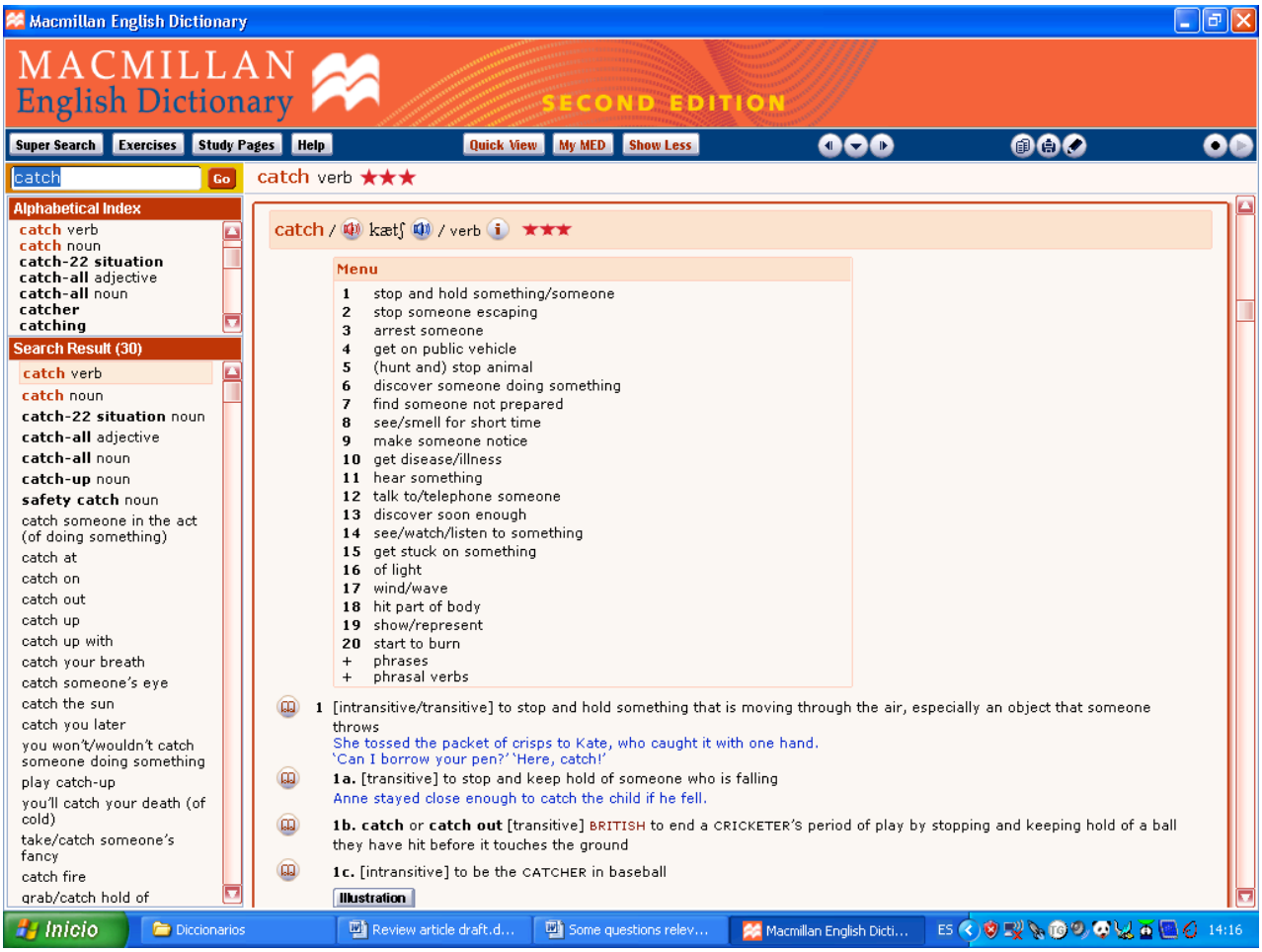

Figure 4. Macmillan English dictionary for advanced learners on CD-ROM (2nd Ed., 2007)

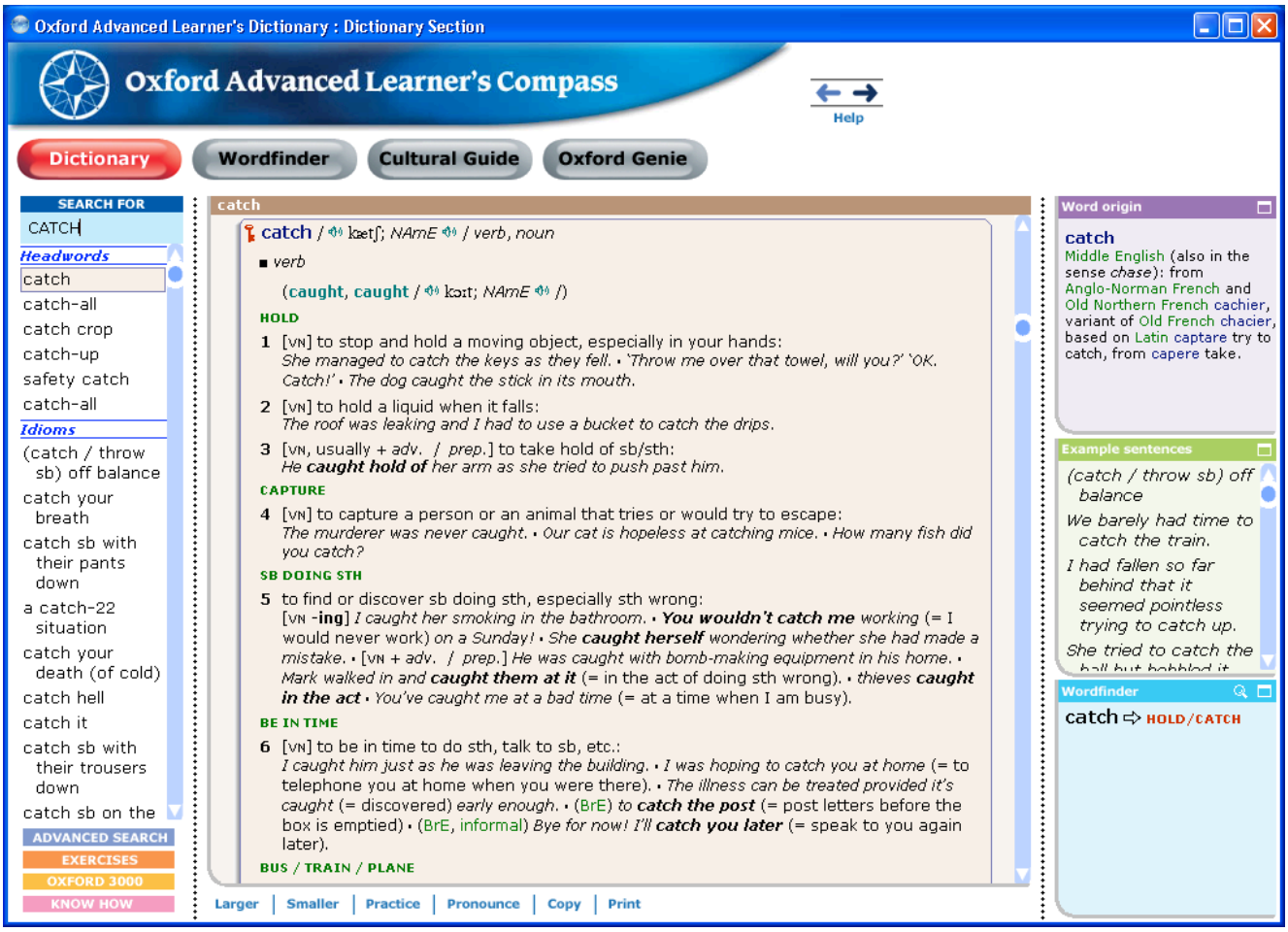

Figure 5. Oxford advanced learner's compass (7th Ed., 2005)

NOTES

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