Entry menus in bilingual electronic dictionaries

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Abstract

The study undertakes to assess the efficiency of entry menus in bilingual dictionaries in the electronic format. An experimental dictionary interface is tested for performance in terms of access speed and task success. The task underlying dictionary use is guided Polish-to-English translation, performed under three conditions by 90 Polish learners of English. The first version of the dictionary displays a complete polysemous entry immediately after an entry is selected. In the second version the user is presented with a menu of senses; once the user clicks on the sense of choice, the full entry is shown, scrolled to the selected sense. The third version is identical to the second, but, in addition, the target sense is highlighted. Our results indicate that a combination of menu-guided sense access and target sense highlighting is effective in terms of both speed and task success, at both user levels investigated. In contrast, the menu alone is not significantly more effective than presenting the full entry at once.

Keywords: bilingual dictionaries, dictionary access, entry navigation, sense-facilitating devices, entry menu, sublemmatic addressing

1. Background

1.1. Access in electronic dictionaries

Efficient access to lexicographic data is one area where electronic dictionaries are expected to excel compared to traditional paper dictionaries (de Schryver 2003). For access to be efficient, users have to be able to find just the information they need (as long as the relevant data are in the dictionary), and they have to be able to complete the search quickly enough for it to be worth their while.

1.2. Problems with accessing dictionary senses

All too often, users fail to locate information in dictionaries even when the relevant lexicographic data is actually there (Nesi and Haill 2002). One particularly problematic step in dictionary consultation is the selection of the relevant sense in polysemous entries. Studies indicate that language learners will often stop at the first sense unless there is a clear indicator that this sense is not appropriate (Tono 1984; Lew 2004).

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2. Sublemmatic access facilitators

To remedy the above problem and facilitate quick and accurate access to the relevant sense, highly polysemous entries can be enriched with entry-internal (or sublemmatic) *access facilitators* which would guide the user to the likely sense at a glance. Two types of such devices have become rather well known from the recent editions of English monolingual learners' dictionaries, which have, one by one, started providing them in longer, highly polysemous entries.

2.1. Signposts

The first of these is a system of sense indicators given at the beginning of each sense. Depending on the dictionary publisher, they are variously referred to as *signposts*, *guidewords*, *shortcuts*, or *mini-definitions* (Tono 1997; Bogaards 1998; Lew and Pajkowska 2007).

2.2. Menus

The signpost system is based on brief sense indicators distributed across the specific senses; a distinct alternative is the entry menu. Here the idea is to gather sense indicators in a single block at the top of the entry proper, creating a kind of "table of contents" of the dictionary entry. An early example from a large Polish-French dictionary published in Poland in 1983 (*Grand dictionnaire polonais-français. Wielki słownik polsko-francuski*) is shown in Figure 1.

człowiek *m.* (*V.* człowieku *a.* człowiecze, *pl.N.* ludzie)

1. *istota ludzka* — 2. *jednostka etyczna* — 3. *w wołaczu* — 4. *w funkcji zaimka osobowego lub nieokreślonego* — 5. pot. *pracownik* — 6. † *sługący*

1. (*istota ludzka*) homme *m.*; être *m.* humain; créature *f.* humaine; (*pot.*) type *m.*; individu *m.*; *antr.* ∼ **biały** homme de race blanche; ∼ **czynu** homme d'action; **dobry** ⟨**przyzwoity, porządny, uczciwy, zacny**⟩ ∼ homme bon ⟨honnête, de bien⟩; ∼ **gołębiego serca** ⟨**o gołębim sercu**⟩ homme

Figure 1: Example entry menu from a Polish-French dictionary

As seen in the example, entry menus in this dictionary are entirely in Polish and appear to be specifically addressed to the Polish user engaged in foreign language text production or L1➔L2 translation. The menu presents a list of sense numbers followed by semantic or grammatical function indicators in the source language, and also some domain, register and currency labels. Note, however, that the menu does not provide any target language equivalents, and this appears to be a good decision if we consider the dangers of the user stopping the consultation at the menu itself, and never going to the full entry. In contrast, menus in a companion French-Polish volume mostly consist

of translation equivalents. In this section of the dictionary the target language is Polish, so the overarching principle seems to be to present menus in the native language of the typical user. This makes sense: a menu is for scanning, and it is obviously easier to scan text in your native language. The dangers of users grabbing Polish equivalents from the menu itself and never reading the full treatment are less severe in decoding than they are in encoding.

2.3. Are entry menus effective?

The use of entry menus to facilitate entry navigation was suggested by Yukio Tono (1984). In a follow-up study (Tono 1992; updated version in Tono 2001, Chapter 10), Tono tested the idea on Japanese learners of English and found the menu helpful in assisting the process of sense selection for learners at the level of junior high school, but observed no such effect for the more advanced group of college students. Tono concluded that the difference was due to poorer reference skills in the junior group. English-Japanese entries were used with invented headwords; the outcome measure was the accuracy of sense selection. Access speed and translation accuracy were not measured.

Apart from Tono's study, there have been a small number of studies looking at the role of signposts for access speed and accuracy (Tono 1997; Bogaards 1998; Lew and Pajkowska 2007), but their results are not entirely consistent and their relevance for menu-equipped entries is rather indirect, so we shall not summarize them here.

2.4. Entry menus in electronic dictionaries

The idea of entry menus in electronic dictionaries can be traced back to their paper ancestry. For example, the *Macmillan English Dictionary,* known for its principled application of entry menus since its first edition (Rundell 2002), has carried over the system to both the PC and online[2] versions. The same is true of electronic versions of the *Longman Dictionary of Contemporary English* (Mayor 2009).

But, quite apart from the lexicographic tradition, the concept of a menu as such is a very familiar one in IT: the average computer users can be expected to be fairly accustomed to using menu-driven interfaces to find their way through collections of options that would be hard to take in if presented all at once. Similar rationale compelled Hulstijn and Atkins (1998: 16) to contrast the following access routes (I leave out the third alternative here):

1. The whole entry is simultaneously available (as it is in a normal paper dictionary).
2. The information in the entry is presented in various phases. At each step, users are given two or more options to choose from, and are thus led towards the information they will finally select (whether correct or incorrect), without seeing all the rest of the information which the entry contains.

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[2] http://www.macmillandictionary.com/

Hulstijn and Atkins do not use the word *menu*, and if we were to follow option 2, then senses other than the one thought to be relevant would actually be suppressed. However, this is not what typically happens in today's e-dictionaries and it is interesting to consider the reasons. These might be any combination of the following: a desire to maintain a degree of continuity in lexicography; a lack of confidence in the user being able to competently select what they really need; a realization that dictionary senses are not in fact discrete entities and the entry is a cohesive text of sorts; not least, inertia and technical difficulty might play a role.

The entry menu may be always-on (*MED*) or invoked by request only (*LDOCE*). Typically, senses on the menu are clickable and the display will ideally scroll to position the target sense at the top of the window. However, depending on the particular combination of sense position, page layout, window size and magnification, the display may not scroll reliably. For example, if the target sense is found towards the bottom of the browser page and the dictionary is viewed in a maximized window on a large display, our sense may not make it to the top of the window.

3. The study

3.1. Purpose

Given the scarcity of experimental studies of entry menus in general, and a complete lack of such studies in electronic dictionaries, we wanted to test the usefulness of entry menus as sublemmatic access facilitators in online bilingual dictionaries. In addition, we elected to compare a new presentation device afforded by modern advances in information technology: the highlighting of the target sense, in the hope that such highlighting would help users locate the target sense more quickly and more accurately. Finally, we wished to see whether subject level or entry length made any difference.

3.2. Instruments and subjects

In order to meet our objectives, we created an experimental electronic Polish-English dictionary interface in HTML and PHP[3], in three versions. In this implementation a list of headwords was presented as an alphabetical list on the left, as is common in electronic dictionaries. But when one of the Polish headwords was selected with the mouse, the three versions of the dictionary behaved differently:

1. the complete entry is presented at once (the NO MENU condition);

2. a clickable entry menu was displayed, and upon clicking on a specific sense, the complete entry was displayed, scrolled to the selected sense (the MENU condition);

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[3] We wish to thank Mr Michał Katulski for his help with designing the interface.

3. an entry was displayed exactly as in 2. above; when the user selected a sense, the complete entry was displayed, again scrolled to the selected sense, but in addition the selected sense was highlighted (the MENU+HIGHLIGHTING condition).

The experimental dictionary featured twenty entries relevant to the task, ten nouns, nine verbs and one adjective, all fairly common words, but here used in the less common and less obvious senses. The entries were adapted from a leading Polish-English dictionary (Linde-Usiekniewicz 2002). They varied in length between four and twelve senses each.

Our subjects were 90 Polish learners of English aged between 16 and 19, at two levels of secondary school (*Liceum*) corresponding to two proficiency levels which we will here refer to as *Lower* and *Higher* for convenience:

1. 1st grade students (pre-intermediate, or A2 according to the Common European Framework of Reference (CEFR)),

2. 3rd grade students (intermediate, or B1 according to the CEFR).

All subjects were computer literate.

3.3. Procedure

Before the experiment proper, the complete procedure was piloted on five intermediate-level students other than experimental subjects. The pilot study revealed a few minor (mainly technical) problems which were corrected for the main experiment.

Subjects completed the experimental task individually at the office of one of the researchers. They all used the same computer and the Opera 9 browser. They were assigned a guided Polish-to-English translation task to be completed on paper. The task consisted of twenty partially translated sentences with gaps at problematic lexical items. Students were instructed in Polish to use the online dictionary to look up those items and complete the translations. The dictionary version was assigned randomly.

3.4. Data analysis

All of the subjects' consultation activity was logged in files, including time stamps accurate to within 1ms. Their translations were later examined and translation accuracy scores were calculated on that basis.

A 3-way ANOVA was computed on sense access times and translation accuracy scores, with proficiency level and dictionary version as between-subjects factors, and entry length as a within-subject factor. Where called for, post-hoc analysis was conducted using the Tukey Honest Significant Difference formula.

4. Results

Figure 2 presents the mean per-entry access times for each of the three dictionary versions. It will be seen that subjects using the version with target sense highlighting took the least time, 25.6 seconds on average, as against 34.1 seconds in the no menu version, and 33.2 seconds for those using the menu but with no highlighting. This difference is highly significant ($F_{(2,1898)}=58.4$, $p<0.001$). Post-hoc analysis reveals that access times are significantly shorter in the menu with highlighting dictionary version than for each of the other two versions.
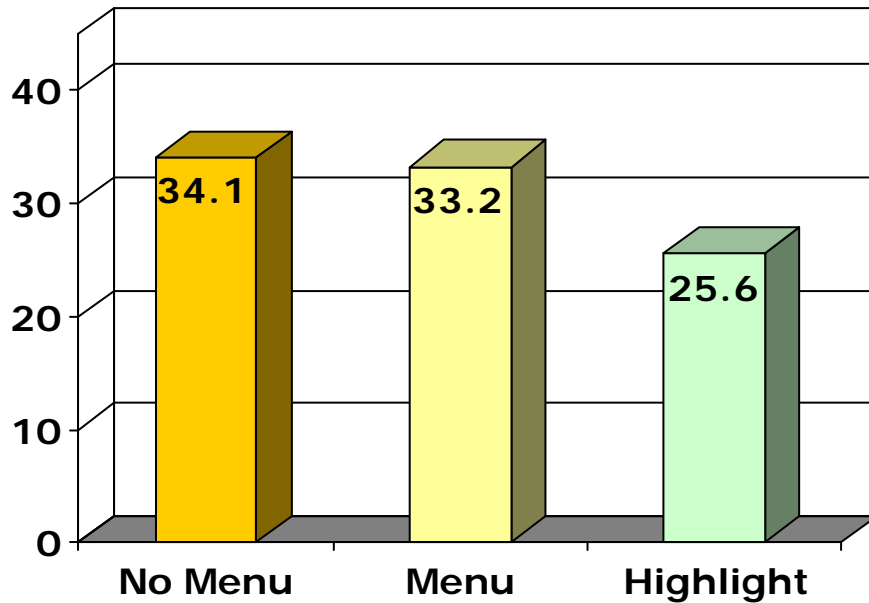

Figure 2: Mean sense access time by version and proficiency level

Next, let us examine how the three dictionary versions serve the two proficiency levels. Figure 3 presents the interaction of version and level on mean access time.
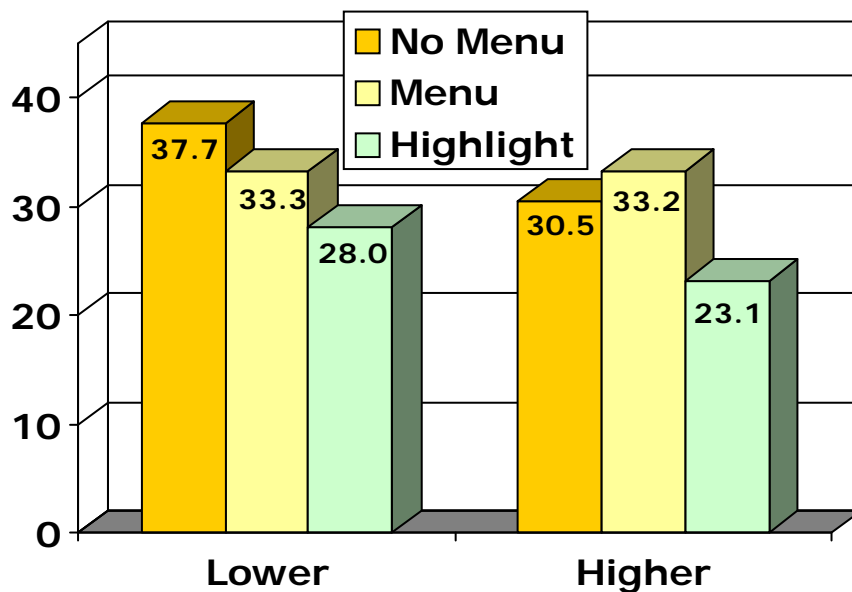
Figure 3 : Mean sense access time (in seconds per entry) for the three dictionary versions

For the lower-level students there is a neat stepwise progression from the no-menu version, which takes the longest (37.7 seconds on average), through the menu version (33.3 sec), to the menu with highlighting, which is the fastest (28.0 sec). In the higher-level group the menu-with-highlighting version is again the fastest (23.1 sec), but here the bare menu performs worse than the no-menu version. Comparing the two proficiency levels using the same interfaces, higher-level students get to their senses faster than lower level students when working with the no-menu version as well as the menu-with-highlighting version, but with the bare menu there is no difference between the higher- and lower-level users. It looks then as if the higher-level students — but not the lower-level ones — somehow get confused by the bare menu version. One possible explanation for this somewhat paradoxical effect might be that our third-graders are already in possession of established habitual reference routines, and these are thwarted when facing a not-too-familiar element: the entry menu. In contrast, their younger counterparts may be less set in their ways when it comes to dictionary use. We have to stress, though, that even if this is a reason for the higher-level users performing worse with menus, such an undesirable effect is fully compensated by the addition of target sense highlighting. It seems, then, that you cannot lose with highlighting.

Next, let us examine the effect of entry length on lookup time. Recall that our dictionary entries consisted of between four and twelve senses. We classified entries of between four and six senses as short, those of seven and more senses as long. With this distinction in mind, refer to Figure 4, which plots mean sense access time for the three dictionary versions, broken down by entry length.
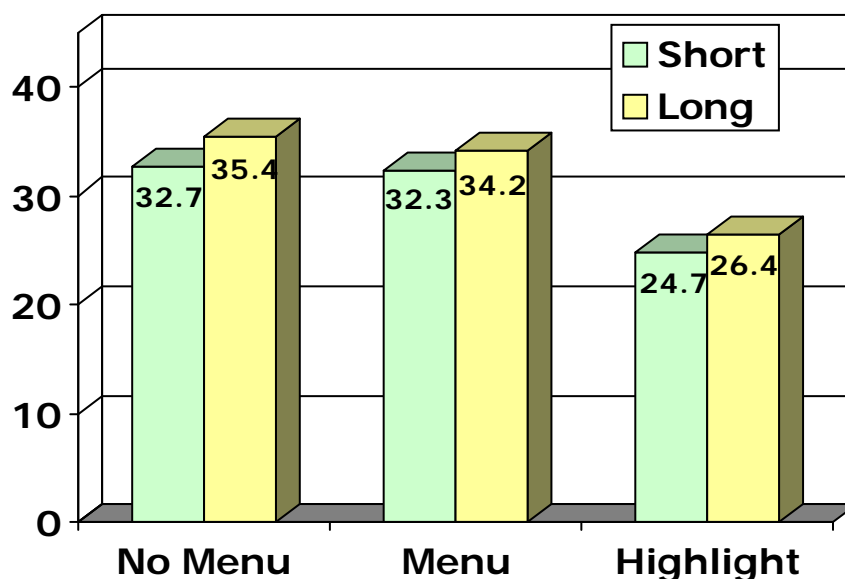

Figure 4: Mean sense access time by dictionary version and entry length

For all three dictionary versions, longer entries take longer to consult, as would be reasonable to expect. But it is striking just how stable this difference is across the three dictionary versions. Clearly, it makes no difference which version you use: a longer entry just takes a fraction longer to process. This makes good sense: even if you include entry menus, the menus themselves must be longer for the longer entries. The interaction of dictionary version and entry length is not significant (two-way ANOVA, $F_{(1,10)}$=0.041, p=0.8, n.s.).

Finally, let us examine the task-related variable, that is translation error rates for users working with the three dictionary versions, again broken down into the two proficiency levels. The respective rates are presented in Figure 5.
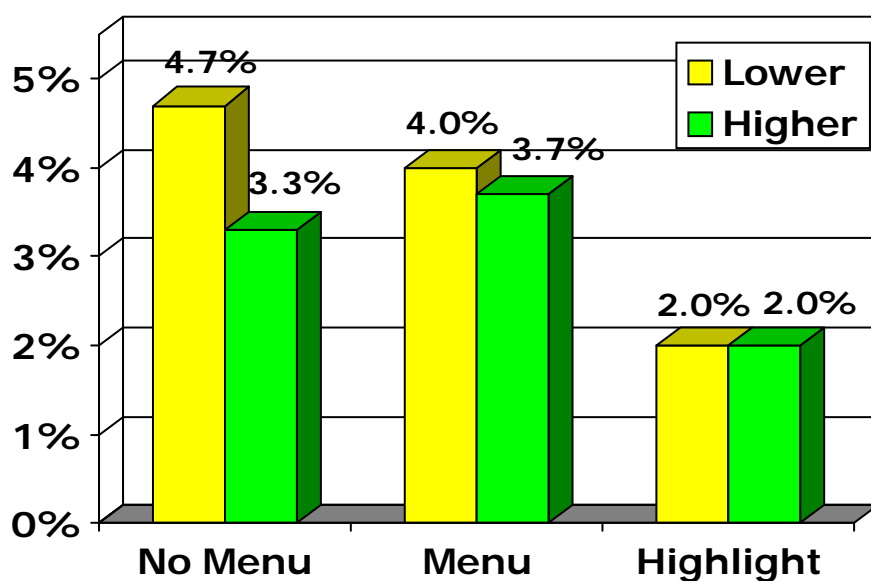

Figure 5: Task error rate by version & level

The error rate for the highlighting-equipped entries is halved compared to the other two interfaces. The effect of dictionary version does not reach significance at the 5% level (one-way ANOVA, $F_{(2, 87)}$=2.6, p=0.08), but the power of the test appears to be somewhat compromised due to a floor effect. However, we should note that reducing the error rate by half would clearly represent a marked improvement, and thus not a trivial finding, even if statistically marginal. Looking at the two less successful versions, we may note that whereas the higher-level students predictably perform better on the translation task than the first-graders when working with the no-menu interface, their advantage just about evaporates when using the bare menu. Here again, we see a problem with the third-grade students interacting with the menu.

5. Discussion and conclusion

Our results indicate that the advantage in access speed comes from sense highlighting rather than the presence of an entry menu alone. However, when the level of proficiency is factored in, bare menus appear to facilitate access for lower-level

students, but hinder higher-level users. In contrast, menus with highlighting seem to assist users at both levels in equal measure.

Translation error rates are largely unaffected by the presence of menus alone, but are reduced by half when highlighting is added.

Thus, we can conclude that in online bilingual dictionaries (used in guided production tasks) target sense highlighting is an effective technique, offering significant benefits beyond the bare menu, both in speed and accuracy, and seems to work well for both levels examined. In contrast, the menu alone is not very helpful, and is actually counterproductive to higher level students in our sample.

The recommendation that follows from our study is that target sense highlighting is a navigation device worth including for polysemous entries, as it assists users in reaching the relevant sense more quickly, and with fewer errors. Before electronic dictionaries get intelligent enough to "guess" which sense is actually needed, they can help users navigate the entry better with sense highlighting, thus contributing to a more user-friendly interface.

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