The language of science: an online animated tool for learning the vocabulary used in the health sciences

Dr Michelle Thunders
IFNHH, Massey University, NZ
Yin Jing
IFNHH, Massey University, NZ
A/Prof Rachel Page
IFNHH, Massey University, NZ

Students often struggle with science content because of their lack of science vocabulary comprehension. Science vocabulary is often derived from Greek and Latin words, languages not familiar to the majority of our students. Knowing common suffixes, prefixes and root words can facilitate student understanding of new complex concepts. Development of a visual, interactive and quick online tool to aid students dissect and decode parts of words and help them to understand the entire word will benefit students otherwise disadvantaged, for example, students where English is not their first language and students who come to us with little or no previous science education as often the case for students undertaking the Bachelor Health Science (BHlthSci) degree. This could also help with first-year student retention as it may help students to not see science words as daunting and confusing and give them confidence in their learning

Keywords: [online tool, health science, vocabulary comprehension, moodle]

Introduction

It has been suggested that one of the biggest barriers to learning science is learning the actual language of science itself. (Wellington & Osbourne 2001). A lack of word knowledge disrupts fluency in reading and interferes with reading comprehension because word meanings can make up as much as 70-80% of comprehension (Pressley 2002). Health science, like all other sciences has a large specific vocabulary associated as well as a high density, compaction of information. For students not familiar with the jargon this can present information overload on their working memory and lead to feeling overwhelmed by the sheer density of information during text processing. Understanding word structure can be a powerful aid for students faced with learning a daunting health science vocabulary, a large number of these words could be understandable if students knew some of the more common root words and be able to break the word down into component parts (Nagy and Anderson 1984)

Effective word learners break down unfamiliar words into constituent meaningful parts, they then hypothesise their meanings and then check against the context of the text they are reading the word in, by doing this they are using their knowledge of high frequency root words to access low-frequency words. It has been well established that knowing a word means not just knowing its definition but also its relationship to other words, the meanings in different contexts and how it can be transformed into different forms (Stahl 1999). The reader's knowledge and meaning of words and concepts are central to their success, with vocabulary linked to proficiency in reading comprehension. A commonality for many of the science terms is their derivative origins from Greek or Latin basis root derivatives. Knowing the meaning of a number of core root derivatives can greatly aid comprehension and make learning a health science subject more accessible.

In their paper on breaking down words to explore meaning, Kieffer and Lesaux (2007) describe key principles for teaching morphology; this is the structure of words with morphemes being the smallest units of meaning. These principles include:

- Teaching morphology in the context of rich explicit vocabulary instruction, this means repeated exposures to words and in meaningful contexts to stimulate an awareness of and interest in words and their meanings.
- Teaching students to use morphology as a cognitive strategy with explicit steps; so to recognise that a word is unknown, analyse word for morphemes, hypothesis the words meaning and then check against the context the word is given
- Teach underlying morphological knowledge needed both explicitly and in context; knowledge of prefixes and suffixes, how words get transformed and knowledge of roots

Mountain (2005) describes that morphemic analysis may be one way to narrow the gap between vocabulary 'haves and have not's'. Understanding the root of a word can help immensely with the comprehension of a science word, i.e. knowing cardio relates to the heart, rhino relates to the nose. Kail (2008) reports how teaching root words to students in an English class facilitated students comprehension in other areas, particularly the sciences. A key to successful vocabulary instruction is to get students engaged in interactive word-learning experience (Harmon 2002) and that which focuses their attention on learning clusters of words that share a common element/origin (Hennings 2000).

It is the case that our student population is becoming increasingly diverse in demographic and with this comes a more diverse base knowledge. A large and rapidly growing proportion of tertiary students in NZ are English language learners and simply lack English vocabulary to comprehend difficult texts. Manzo et al (2006) report a decline in vocabulary levels of college bound 18-year olds and at the 100-level there are also students with little or no prior science background, or those who are re-entering into study after a long period of time. Therefore great differences exist between individual vocabulary levels of students taking a paper at any given time, part of our role as educators is to try to level this disparity and facilitate learning strategies for those students with a more limited vocabulary.

Aim

To develop a highly visual, online tool to embed in the stream (Moodle) online learning environment to facilitate recognition and learning of root words commonly found in BHlthSci 100-level papers; 214102:Applied science for health professionals and 214101: Normal body function . The aim of this tool is to focus on the relationship between learning vocabulary and reading comprehension, that growth in vocabulary knowledge and comprehension occurs more from seeing words in context rather than defining words in lists.

Methods

The teaching team (who are all heavily involved in the teaching of the 100-level BHlthSci papers on three campuses) initially developed a list of key scientific terms that are used in the 100-level health science papers. This list of words formed the basis of the initial tool developed. The initial tool was circulated around departmental teaching staff for input and feedback on additional roots and words to include. The tool was developed as a PowerPoint presentation comprising text and graphics imported from Clip Art and on continuous loop, initially at 6 seconds per slide with a pause function. This was integrated into the student's Moodle learning environment for the paper as a 'pop-up' that the students could interact with. In addition the PowerPoint file was converted to a Flash Video (.FLV) format using the Xilisoft PowerPoint to Video Converter Free1.1.1. The video was then embedded in the Moodle online learning environment for the Applied Sciences for Health Professional site.

Outputs

The tool was developed as a PowerPoint presentation on continuous loop that was integrated into the student's moodle learning environment for the paper. It is also available for the students to open up as a separate entity and engage further with the tool if so desired. The tool is divided up into alphabetic categories and then commonly used roots in each category are demonstrated visually alongside basic definitions of terms commonly used in the health science papers. The key is to make it clear, simple and visual to aid memory by association of the words with the visual representations. The roots are grouped alphabetically on a title slide (see Figure 1 for example) for ease of navigation and hyperlinked so students can navigate the tool easily, if they so wish. For each of the initial 70 core root derivatives there is a separate slide with a pictorial representative and word descriptor of the root meaning as well as several applications and brief definitions of the root in the context of the health sciences papers taught at 100-level to the B Hlth Sci students (Figure 2). Additionally there is also the

facility for the students to open up the tool as a separate entity in PowerPoint and engage further with the tool if so desired. The tool is seen as an evolving application, and an 'add word' function is also present so students can enter suggestions for inclusion of words that they find difficult to be incorporated in the tool. The Stage 1 roll-out of the tool was for the 100-level paper Applied Sciences for Health Professionals in Semester 2 July 2013, with more than 300 students enrolled. Stage 2 roll-out after student feedback will be summer school November 2013 and Semester 1 2014 for students taking the Normal Body function paper, again with more than 300 students enrolled).

Figure 1. Screen shot of root derivative top slide G-J

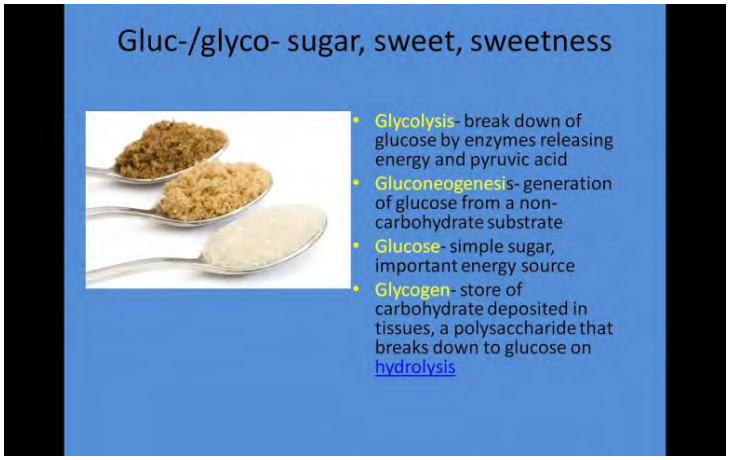

Figure2. Screen shot of an example of a root derivative with pictorial representation and Health Science contextual description

Conclusion

This paper reports the development of a simple tool designed to enhance student learning through the improvement in comprehension of basic health science vocabulary. The tool has been integrated in the Moodle online learning environment as a 3 minute video and as a function that can be downloaded and interacted with on slower time. Student usage will be monitored over the next year and a question relating to students perceived the usefulness of the tool will be incorporated in the end of paper surveys. This tool is now available to all 100-level health science students taking the applied science paper and will evolve in response to student input and feedback.

References

Harmon J, Wood, K, Hedrick W, Vintinner J and Willeford T 2009 Promoting vocabulary learning with the interactive word wall. Middle school journal, 40 (3), 58-63

Hennings D 2000 Contextually relevant word study: Adolescent vocabulary development across the curriculum. Journal of adolescent and adult literacy, 44(3) 268-279

Kieffer M and Lesaux N 2007 . Breaking down words to build meaning: morphology, vocabulary, and reading comprehension in the urban classroom. The reading teacher 61(2) pp134-144

Mountain, L 2005 ROOTing out meaning: more morphemic analysis for primary pupils The reading teacher, 58 (8), 742-749. https://doi.org/10.1598/RT.58.8.4

Manzo, A, Manzo U, and Thomas M,. 2006 Rationale for systematic vocabulary development: antidote for state mandates. Journal of adolescent and adult literacy 48(7) 610-619. https://doi.org/10.1598/JAAL.49.7.6

Nagy W and Anderson R How many words are there in printed school English? Reading research quarterly, 19, 304-330. https://doi.org/10.2307/747823

Wellington J and Osbourne J 2001 Language and literacy in science education. Philadelphia, PA: Open University press

Pressley M 2002 Comprehension instruction: what makes sense now, what might make sense soon Reading online, 5 (2)

Stahl S 1999 Vocabulary development . Cambridge, MA, Brookline books

Authors' details: Michelle Thunders. Email: M.Thunders@massey.ac.nz

Please cite as: Thunders, M., Jing, Y., Page, R. (2013). The language of science: an online animated tool for learning the vocabulary used in the health sciences. In H. Carter, M. Gosper and J. Hedberg (Eds.), *Electric Dreams. Proceedings ascilite 2013 Sydney*. (pp.875-878). https://doi.org/10.14742/apubs.2013.1406