Visual processing skill barriers in students with Arabic as a first language

Jennifer Ball

Muna Kashoob

Salalah College of Applied Science - Oman

Abstract

Most teachers in the Gulf would agree that Arab learners struggle more with reading and writing than listening and speaking. One little considered possible influence on this is the particular visual processing requirements of English. This article suggests why visual processing or visual cognition might be a particular difficulty for Arab students reading English. It offers a simple classroom checklist that may assist teachers to notice if visual processing strain could be effecting their student's attention, motivation and performance.

Introduction

It is known that being literate in one language assists with acquiring literacy in another (Dweik & Abu Al Hommos, 2007). However, what has not yet been established is whether learning to read in one language will necessarily develop all the visual cognition skills required to read in another. Because visual cognition skills are developed during the process of learning to read, it is possible that slightly different skills are developed learning to read different orthographies. If present, these differences could lead to visual processing strain which would increase student's overall cognitive load, thereby decreasing attention, task motivation and achievement. Thus far, the discussion of visual cognition has primarily happened in the domain of cognitive neuroscience, making it somewhat inaccessible to educators in other fields. This article aims to bring the discussion to the university classroom by presenting the initial development of a very simple classroom observation tool that teachers could use to raise their awareness of potential visual processing strain in their students.

Seeing text

Vision is such an everyday thing for most of us that we take it for granted. We rarely consider how all that information gets to our brains and is converted into something approximating the physical world. This *visual cognition*, or the unconscious process of combining input from our eyes with prior knowledge to make meaning, is sometimes also called visual processing or visual perception. Visual cognition is fundamental to reading because it is how we select and identify the salient features of script in order to recognise letters and words. Visual cognition requires the combination of a range of skills that are acquired while interacting with the world. If a skill is not used then it is not developed. Specifically, those skills required to read are developed learning to read. With repetition or practice, good readers learn to apply these skills automatically, which means they are applied without the need for conscious consideration. Skills applied automatically will use minimal active cognitive capacity; sometimes referred to as our working memory (Baddeley, 2002). This is important because working memory is believed to have a very limited capacity (Miller, 1956). If a reader needs to apply conscious analysis to the visual processing of the text, they will have less working memory capacity available for simultaneous

comprehension or critical evaluation. This does not mean these learners cannot comprehend or evaluate the text but that a second or third reading may be necessary to facilitate consecutive rather than simultaneous comprehension and evaluation.

The problem for non-native readers

There is already much evidence in the literature that suggests that it is worth considering potential differences between the reading specific visual cognition skills of various language groups. For example, not only are there known differences in the cognitive strategies involved in reading different languages but non-native readers often continue to apply their first language (L1) strategies when they read English, even if these strategies are inappropriate (Hong-Nam & Leavell, 2006). This suggests they are not skilled at applying the appropriate ones. Other researchers have used neural imaging to show general differences in cognitive activity while reading different languages (Chen, Vaid, Bortfeld, & Boas, 2008). These differences can be seen in both the level and location of brain activation. With specific regard to visual cognition, there is evidence that there are cultural differences in general visual perception skills. Rosselli and Ardilla (2003) reviewed the literature on cross cultural differences in performance on non-verbal visuoperceptual and visuoconstructional ability tasks and found much research that has highlighted cross cultural differences. Given all this evidence, it seems worth considering that these differences might affect non-native readers' visual processing of English text.

Arabic

This research focused on learners whose L1 is Arabic. Teachers in this journal and elsewhere have noted that they had to adjust their usual teaching practices, often slowing the pace of lessons, when they started teaching students in the Gulf (Khelifa, 2009; Sonleitner, 2005). While there are undoubtedly many factors contributing to this, particularities in the Arabic writing system are one of the less frequently explored.

Arabic uses a 28 character phonemic (i.e. sound-based) alphabet written horizontally from right to left. It is always written in cursive form, that is, with most of the letters within words joined together. Different letters can share the same core shape and be distinguishable only by small dots above, within or below the letter; and most letters change shape according to their position in the word. As a result, Arabic script has "similar graphemes [written symbols] representing quite different phonemes [sounds], and different graphemes representing the same phoneme" (Eviatar, Ibrahim, & Ganayim, 2004, p. 175). Two letters representing long vowels are also used to represent consonants; short vowels can be represented by small diacritical marks above or below a consonant, although these are omitted in most text so that vowels need to be inferred from context by the reader (cf. the pronunciation of 'read' in "She read the book" and "Did she read the book?"). When the short vowels are represented, Arabic is considered a 'shallow' orthography, i.e. using a highly consistent set of grapheme-phoneme (letter-sound) correspondences. This means it is quite an easy and consistent process to decode the print letters to reach the pronunciation of the word. The complication comes when it is written in its devowelled form as this creates a large number of homographs, or words with the same spelling but different pronunciations and meanings (Abu-Rabia, 2001).

The word-structure of Arabic varies greatly from that of English. Whereas in English parts of words are linked together consecutively in a linear fashion, Arabic word-parts are complexly layered into the word. One layer is the consonantal root, which provides the semantic information or meaning. Most frequently these roots are said to contain three to four consonants (Abu-Rabia & Awwad, 2004; Farid & Grainger, 1996), though there is also a case for bi-consonantal roots (Boudelaa & Marslen-Wilson, 2001).

The letters of a root do not necessarily appear consecutively in the word. A second layer is a vocalic element comprising of vowels, including short ones which, as previously mentioned, may not be visually represented in the word. This morpheme conveys syntactic or grammatical information (cf. in English present "take" vs. past "took"). A further layer is the use of prefixes, infixes and suffixes. This provides a template of consonant-vowel sequences which provide the timing and phonological shape referred to as the word pattern (Abu-Rabia & Awwad, 2004; Boudelaa & Marslen-Wilson, 2001). One difference between the proponents of two- and three-letter root theories is that the two-consonant root theorists suggest that in most roots the third letter is actually adding phonological input as part of the word pattern rather than semantic meaning as part of the root (Boudelaa & Marslen-Wilson, 2001). According to Feldman, Frost and Pnini (1995, cited in Abu-Rabia & Awwad, 2004), it is the complex interlacing of the word pattern with the consonantal root that can cause the reordering of the letters within the root. In summary, Arabic words have an extremely complex range of forms, based on consonant roots and phonological structure that cannot easily be made explicit by alphabetic cues.

Arabic L1 ESL students

There are several, compelling reasons to consider differences in the visual processing skills of Arabic and English L1 readers. Importantly, Arabic L1 learners do not tend to favour visual learning in general. Rahal (2010) tested students in a University in the UAE and found most favoured 'oral word' as a perceptual style; only 15.8% preferred *visual word*. With specific regard to reading, there is evidence that Arabic speakers might be less likely than other students use '*bottom-up*' visual processing strategies when they read. Abbot (2004) found Arabic L1 students tended to score higher on questions requiring contextual, global '*top-down*' strategies than Chinese readers, who outdid the Arabic readers on word analysis strategies. Similarly, Fender (2003) found Arabic learners used meaning and context more than Japanese learners. One theory as to why top-down processing seems to be so heavily relied on by Arabic L1 readers is that when Arabic is written in its usual, de-vowelled form, the large number of identical-looking words cannot be discriminated without referring to sentence context to know which word is intended (Abu-Rabia, 1997, 2001). Of course context helps all readers; but whereas low level English readers benefit much more from context than higher level readers (Stanovich & Freeman, 1981 cited in Abu-Rabia, 2001), research has shown that Arabic readers at all levels significantly benefit from use of context, suggesting that referring to meaning is more essential in Arabic reading.

When Arabic readers do appear to use bottom-up visual processing for word recognition, it has been shown to be slower than that of native speakers of other languages including English (see Eviatar, Ibrahim, & Ganayim, 2004, for references to studies on several languages). Ibrahim (1998) even found Arabic L1 speakers fluent in Hebrew could process Hebrew words faster than Arabic words when the words were presented visually but not when they were presented orally (cited in Eviatar, Ibrahim, & Ganayim, 2004). Other research on Arabic word reading has shown visual priming (prior exposure to a similar word pattern) increased lexical accuracy but not speed of decision making (Abu-Rabia & Awwad 2004). It is likely the visual complexity of Arabic script, with small, meaning-laden details, makes visual decoding slow. Abu-Rabia and Awwad (2004) also include the cursive nature of Arabic script as a difficulty. Another explanation for these results could be that Arabic readers do not tend to use the faster, direct visual-to-meaning approach at all, but rather use the alternate bottom-up reading strategy of phonological (sound-based) processing. Eviatar et al. (2004) suggest the morphological layer of the word pattern in Arabic words might use phonological featural elements such as a labial (a sound made using the lips) followed by a pharyngeal (a sound made by restricting the pharynx), which could be realised by any of several letters. It seems the meaning created by such features could not be accessed by a direct visual process but only through a secondary step of referring to the sound or kinaesthetic feel

of making the sound, which would then articulate the word pattern, thereby adding a layer of meaning. On the other hand, Arabic short vowel phonemes cannot usually be accessed from a visual cue if diacritics are not included; so it seems phonological processing would not always be a simple linear step from written symbol to sound, but would sometimes require simultaneous use of context to reach the sound. One final point about phonological processing of Arabic needs to be made. For a considerable percentage of students across Arabia, Arabic is not their first language: at home they speak an unwritten tribal language quite distinct from Arabic (Crosbie, 2014). Furthermore, Arabic is a diglossic language "whereby the spoken language is totally different from literary Arabic, the language of books and school instruction" (Abu-Rabia, 2000, p. 147). Therefore, even for those students who speak Arabic at home, the Modern Standard Arabic (MSA) used in the classroom is so different from their spoken dialect that it has been said that all Arabic students learn to read and write in their second language (Abu-Rabia, 2000). As not all the sounds used in MSA are necessarily used in students' own language or dialect, it is possible that some students may find phonological processing a challenge. In summary, it seems likely that Arabic readers use a simultaneous combination of sound-based and context-based processing but are unlikely to rely heavily on a direct visual to meaning route. This contrasts with English readers, who are known to use the three routes quite independently of each other and in fairly even amounts (Pelli & Tillman, 2007).

Visual cognition skills

Of course, some bottom-up visual processing must be used to read Arabic script, as ultimately the information must be extracted from its visually presented form. Yet even at the most fundamental level of extracting the visuals from the page, there are some interesting differences to consider in terms of the individual visual skills required to read Arabic as opposed to English.

Most obviously, the spatial skill of directionality could be important, given that Arabic is written from right to left as opposed to the left to right direction of English. Directionality can also come into play when discriminating letters in terms of orientation (for example in English the letters *b*, *d*, *p* and *q*). Discrimination by orientation requires the reader to suppress the usual skill of constancy, whereby an object is recognized as the same when viewed from different angles. Although the orientation of the object appears to the viewer in reverse when viewed from behind, this orientation is automatically ignored and the object is recognised as the same object. However, in reading English, this everyday skill of constancy must be overridden and the orientation noticed to distinguish otherwise similar letters such as *b* from *d*. There are no letters in Arabic that need to be discriminated purely in terms of orientation, and to add to the difficulty there is no distinction between the sounds /p/ and /b/ in spoken Arabic (Ibrahim, 1978). Arabic L1 readers do have some need for discrimination by orientation because most Gulf countries use numerals usually referred to as 'Indian', which include two numbers that are the reverse of each other: ٢ (2) and ٦ (6). However, it is not clear how much this would help with word reading because it is known that readers use different visual strategies when processing strings of numbers than they do for words (Randall, 2007).

Another spatial skill is the ability to register the spatial relationship of one object to another. In English, the relationship of letters to the (usually invisible) line is important. The capital form of some letters is primarily distinguished by its position on this line as in: *p* vs. *P*, or *y* vs. *Y*. Not only does Arabic not have capital letters, but also some Arabic letters which hang below the line in their printed form, shift onto or above the line in their handwritten form with no consequent change in meaning (Wightwick & Gaafar, 2005).

Spatial relation skills underpin the skill of visual sequential memory, or the ability to recall items in series. This is a hugely important skill in English, where irregularities in spelling make it impossible to

decide the spelling of many words letter-by-letter. However, visual sequencing may not play as important a part in Arabic reading. Because most Arabic letters change shape depending on whether they come in the beginning, middle or end of the word, shape discrimination might support sequencing in Arabic word decoding. Furthermore, because the consonantal root of an Arabic word can appear with the letters separated or even in a different order (Abu-Rabia & Awwad, 2004; Boudelaa & Marslen-Wilson, 2001), in reading, though not writing, it is more necessary for readers to recognise the group of letters than their sequence.

Visual attention

Another potential point of difference between Arabic L1 and English L1 readers is visual attention. At the level of letter recognition, it is possible the features of the letters may require different attentional focus. Lanthier, Risko, Stolz, and Besner (2009) showed that vertical lines are extremely important in the recognition of English letters. It is also the case that there is more salient information at the top than the bottom of English script (Birch, 2007) – try it yourself by covering first the upper half of a line of text and then the lower half and seeing which is easier to read. On the other hand, Arabic letters have a lot of salient information in small marks above and below the line, requiring a broader, split scan. This might be an unfortunate attention habit to bring to English reading, as poor English readers have been seen to demonstrate a broader scanning strategy than good readers (Facoetti, Paganoni, & Lorusso, 2000).

At the level of word reading, a clear difference in visual attention has been demonstrated. When reading English, Arabic readers have been shown to pay less attention to vowels than other L1 ESL students or English native speakers, causing them to have far greater difficulty processing English language words (Hayes-Harb, 2010; Ryan & Meara, 1992). This may be a result of the devowelling of most Arabic text. However, because attention directs eye movements (Rayner, 1998), the problems Arabic L1 students have with visual attention are far more complex than devoweling can explain. For example, Randall & Meara (1988) found that Arabic readers tend to look first at the middle and then the edges of a word. This is quite different to English L1 readers, who tend to pay more attention to the letters at the beginning and then the end of a word, reflecting the fact that more salient information is at the beginning of English words. Average initial eye fixation points for English readers are asymmetrical, slightly left of centre to facilitate this optimal scan (White & Liversedge, 2006). In their longitudinal study, Randall & Meara (1988) found that Arabic L1 readers continue to use the Arabic style scanning strategy to read English words, and that this pattern does not tend to change as learner's English proficiency increases (Randall & Meara, 1988). In fact, scanning strategies are known to be very robust (Pollatsek & Rayner, 2005; Vaid, Rhodes, Tosun & Eslami, 2011), so it is not surprising that this problem persists even with higher level students. Other research has linked initial eye fixation points in Arabic word reading to the morphological structure of Arabic words, suggesting that the symmetrical pattern is due to a balancing out effect of equal use of prefixes and suffixes in Arabic morphology (Farid & Grainger, 1996). Interestingly, the French L1 speakers in Farid & Grainger's study did not show similar sensitivity to manipulation of different forms of French words. The researchers suggested the devowelling of Arabic may increase the influence of morphological structure on eye landing points.

There are two problems with inappropriate attention: Firstly, unnecessary information is brought into working memory, wasting capacity. Secondly, possibly not enough necessary information will be obtained from the initial inefficient scan and so a second scan may be required to get more information. This would not only slow reading down but also take up capacity, because the second or third scans must be held in working memory until the information can be combined. Therefore, inappropriate visual attention, like all poor visual processing, will lead to higher cognitive load.

The research

Given all of these factors, it seems likely that many Arabic L1 readers would demonstrate some signs of visual processing strain in an English-language classroom. These signs can easily be misinterpreted as laziness or lack of motivation. Of course not all Arabic L1 learners will encounter the same level of difficulty: in a study comparing the English word processing skill of Arabic L1 with other L1 learners of English as a second language (ESL) at the same level of English proficiency, Ryan and Meara (1992) noted the extremely high standard deviations of the Arabic L1 data, indicating a huge range in abilities. It is important then, for teachers to have some way of identifying those students who might be struggling with visual processing skills. Following is a report of a small pilot study undertaken to explore this idea.

The specific questions addressed by this study were:

- Do Arabic L1 ESL students demonstrate behaviours, identifiable by teachers, which might indicate visual processing strain?
- Is there a relationship between these behaviours and their English language learning?

Context

The research was conducted in the foundation program of a public University in the UAE. Students in the program have finished high school with high enough grades to enter university but do not yet meet the English language requirements for the English medium university. Typically, they will have studied English as a subject at school but the language of instruction in most schools in the UAE is Arabic although a bilingual system is gradually being introduced.

Procedure

Ethical clearance was obtained from the participating university. To meet the requirements of this agreement, all teacher participants and the students they observed were given information sheets and asked to sign participation agreement forms. These were not translated from English to Arabic for the students but the teachers, who were all native English speakers, discussed the information with the class until they were satisfied the class understood. One student from one class declined to participate and so was not included in the teacher's recorded observations.

For recruitment, an e-mail was sent to all teachers in the foundation program through the university e-mail system. The e-mail outlined the study and asked for volunteer participants. Although seven teachers initially responded agreeing to participate, only four of these eventually took part. The remaining three did not complete the task before the end of semester. Teachers were asked to observe their class during normal lessons and for each student to tick any behaviours, from a list, that they observed. Each teacher observed their own class. By her own request one of these teachers also observed her new class the following semester as she felt that class would be an interesting case in the study. This made a total of five classes over three levels of the language program: four classes of females and one of males. Students in these levels range from pre-intermediate to intermediate in their level of English. Students' ages were not recorded but typically students come straight from high school into the foundation program. A total of 50 students were observed and the tool development statistics were based on the total of responses about them. However, not all the teachers submitted their final grades to the research so correlation between final grades and statistics reported here includes only 34 students.

Tool development

No existing tool that would have been appropriate for the specific aims and setting of this study was found; it was therefore necessary to develop one. The aim of the tool development was to create an instrument suitable for use in an English language classroom that could provide teachers with an indication when visual processing might be causing difficulty for their students. The design of the tool was based on behavioural check lists used as early indicators of non-verbal learning disabilities. The rationale behind this was that these lists attempt to specifically indicate possible delays in the development of visual perception skills as opposed to more general ability. They are not diagnostic tools but are used to detect early indications that further investigation might be warranted. This seemed appropriate to this study which sought to provide some evidence that visual processing difficulties may be an issue in the ESL classroom in an effort to promote interest in further research on the topic. Finally, these tools are known to be user friendly and are often recommended to parents and teachers who are concerned about a child's reading development. For example, Sperry (2012) describes the Children's Nonverbal Learning Disabilities Scale (C-NLD) (Goldstein, 1999), as designed for use by parents. It seemed, therefore that teachers would not require any special training to administer this type of tool.

The tool content was based on work by Garzia et al. (2008) who provide detailed notes regarding the signs and symptoms of visual information processing difficulties. For this research, only items which seemed relevant to an adult English language classroom were included. The types of item excluded were, for example, 'displays poor balance' as this looks at the skill of laterality and therefore appears to be directed towards more general visual development rather than the specific individual visual processing skills required for reading. It is not presumed that ESL learners would have poor visual processing skills in general but that they might have different visual processing skills to English L1 readers. A checklist of 14 items was created. There was a column that teachers could add comments if they wished. A note towards the ongoing development of such a tool is that teacher participants used the comments column almost exclusively to indicate degree, for example "YES ALWAYS!!!!!" or "just occasionally". This suggests a Likert type response criteria indicating degree might have been more appropriate than the yes/no response allowed by the simple tick sheet.

After the data was collected the results were examined statistically using SPSS version 18. Firstly, the frequencies were checked and because there was only one reported case of unusual pencil grip, it was decided that this was perhaps only suited to the original disability scale and so that item was excluded from the analysis.

Next the internal consistency of the items was measured using Cronbach's Alpha coefficient. This indicates to what extent the items all seem to be measuring the same thing. The list as a whole had an acceptable internal consistency as Cronbach's Alpha coefficient was just ≥7 (Pallant, 2011) at 7.1. However, four items had Corrected Item Total Correlations ≤ 0.3 indicating they were perhaps not measuring quite the same thing as the other items. This was further confirmed in a principal component analysis as all four loaded at <0.3 in the first component. Analysis of the qualitative data provided by the teachers' comments returned with their checklists, showed these items to have been somewhat problematic in this setting. Several teachers left comments indicating these were not easy items for them to assess. The first of these items, 'Is performing below your expectations', seemed to have been too subjective and teachers were reluctant to say they had high or low expectations for any student. The second item, 'Is a strong English speaker', attracted comments such as "is at appropriate level". If a similar item were to be included to a future version of this tool then perhaps it could be reviewed to read: 'Speaking is the student's strongest skill'. For the third item, 'Omits small words when reading',

several teachers noted that they don't often ask students to read aloud in class so were unable to answer. This item is possibly not appropriate in primarily communicative style classrooms. The final item, 'Continues talking even when asked to stop', is interesting. It had the highest frequency of reporting. The item was intended to indicate when a student tends to default to oral skills because their visual skills are weak. However, in this case, it could simply be a reflection of the strongly oral culture in the UAE (Lovering, 2012). It could also be that this item reflects differently in an adult education environment, where discipline is generally less of an issue than it is in the children's educational settings for which these question types were originally designed. Removing these four items brought Cronbach's Alpha coefficient up to 7.9, which suggests the remaining list is indicating the same concept. Of course it cannot therefore be presumed that they indicate definite visual processing strain. Like the checklist this list is based on, it aims only to identify enough evidence that further testing for visual strain is warranted.

The checklist

The final checklist of nine items used in the analysis was as follows:

- Tilts head or closes one eye when reading.
- Avoids or seems to have difficulty copying from whiteboard.
- Avoids reading.
- Writes uphill or downhill.
- Has poor spacing in writing.
- Has a short attention span.
- Has difficulty completing assignments in time allotted.
- Has difficulty organizing his/herself for study, e.g. remembering book and pen.
- Fatigues easily.

A further principal components analysis showed that the nine items identified two components that explained 54.55% of total variance. This can be understood to mean that the items fall into two more broadly defined groups that might contribute to visual processing strain. The first five items above, which relate specifically to reading and writing, loaded into the first component. The second component, made up of the last four items above, relates to more general study skills. There is some evidence that a considerable percentage of Gulf state high school graduates have low Arabic literacy (United Nations Development Organisation, 2004). As previously discussed, visual processing skills are developmental: they are developed during the process of becoming literate. For this reason, students demonstrating the second group of behaviours indicating poor study skills, might also be expected to have poor visual processing simply because they have not practiced these skills enough yet. However there is a reciprocal relationship between the two groups of skills. If students do not develop their visual processing skills, they may also not be able to develop these sometimes more obvious general study skills. Therefore, both groups of items are potentially useful as early indicators of visual processing difficulties.

Correlation results and discussion

There was a strong negative correlation between the number of observed behaviours and final grade for the term ($r = -.62$, $n = 34$, $p < .001$). That is to say, a higher number of observed behaviours was associated with lower final grades. This in itself is not really surprising, given the nature of some of the

items. However, there was no significant difference between the predictability of the items. Those items that perhaps did not intuitively appear likely to predict lower achievement levels, for example, 'Tilts head or closes one eye when reading', were just as likely to predict final grades as the more apparently obvious ones. The significance levels indicate that the checklist can help to explain 38% of the variance of final grades.

There were no significant differences in any between group effects. For example, there were no significant differences to be noted between the teachers. It seems the teachers were able to administer the tool consistently, without previous experience of it. There were also no significant differences between the male and the female students. This is to be expected; although non-verbal learning disabilities are more common in males than females (Quinn & Wagner, 2015) a difference was not expected in this study which is looking at a lack of learnt skills as opposed to disability. Although there is usually a separation of genders in education in the UAE, there is no reason to suspect the education experiences would be different between males and females. Finally, there was also no significant difference between the higher and lower level classes. This might seem to suggest that visual processing does not become less of a problem as English levels improve, which would be consistent with the literature (Randall & Meara, 1988). However, there was not really a large enough range of levels in this study to confirm this.

This seems a strong enough result to suggest that the tool might be of some use to teachers. Having said that, it is important to reiterate that this tool is not presented as a diagnostic device. At best, it is an awareness raising tool. It might be used by teachers to help them separate strain initiated by underdeveloped visual perception skills from other issues affecting their student's motivation and performance.

Conclusion

This article aims to bring a discussion of early visual perception skills to the university teaching community and to raise awareness of the possibility that students may not come equipped with the many and complicated visual processing skills required to read and write English. The results of this study suggest that teachers of Arabic L1 students need to consider visual perception skills when managing their students' cognitive load in reading and writing tasks. This tool was developed because results of visual processing strain can be subtle and easily dismissed as lack of motivation. It is not a case of students not being able to perform certain tasks, but rather that the additional strain will make them tire more easily or perhaps use avoidance strategies. While this research focused on Arabic L1 learners, potentially there are differences in the perceptual skills of all non-English L1 learners – including those with L1 backgrounds that also use roman letters, as there are still differences at word level. A wealth of good advice for managing cognitive load can already be found in the cognitive load theory literature (Mayer, 2009; Schnotz & Kürschner, 2007; Sweller, van Merrienboer & Paas, 1998; Yeung, Jin, & Sweller, 1998).

There are further implications for equity in assessment in multi-national classrooms. Because reading requires visual processing + comprehension + critical evaluation, when the cognitive load of the visual processing is high, ESL students are more likely to need additional time for second and third reads to facilitate performing these tasks consecutively rather than concurrently. There could also be a higher fatigue factor for them. This will be particularly true in highly visually demanding tests such as multiple choice, scrambled sentences or when there is split attention such as a listening task which requires simultaneous reading and writing.

Though this was only a very small pilot study, it is hoped that it might encourage some conversation around this topic that will lead to further research. For example, it would be interesting to see an in-depth comparison of the visual perception skills of learners from different L1 backgrounds. Furthermore, it is not clear whether these skills can be taught as discrete skills. This is a controversial point in the context of disability but may or may not be as problematic in an ESL situation, where the issue is usually developmental as opposed to one of disability. We hope that further research will address these questions in the future.

References

Abbot, M. (2004). The identification and interpretation of group differences on the Canadian Language Benchmarks Assessment Reading Items. In *Annual Meeting of the National Council on Measurement in Education (NCME) San Diego, California, USA* (pp. 1–41). San Diego, California, USA.

Abu-Rabia, S. (1997). Reading in Arabic orthography: the effect of vowels and context on reading accuracy of poor and skilled native Arabic readers in reading paragraphs, sentences, and isolated words. *Journal of Psycholinguistic Research*, *26*(4), 465-482. http://doi.org/10.1023/A:1025034220924

Abu-Rabia, S. (2000). Effects of exposure to literary Arabic on reading comprehension in a diglossic situation. *Reading*, *13*, 147–157.

Abu-Rabia, S. (2001). The role of vowels in reading Semitic scripts. *Reading and Writing: An Interdisciplinary Journal*, *14*, 39-50.

Abu-Rabia, S., & Awwad, J. (2004). Morphological structures in visual word recognition: the case of Arabic. *Journal of Research in Reading*, *27*(3), 321–336. http://doi.org/10.1111/j.1467-9817.2004.00235.x

Baddeley, A. D. (2002). Is working memory still working? *European Psychologist*, *7*(2), 85–97. http://doi.org/10.1027//1016-9040.7.2.85

Birch, B. M. (2007). *English L2 Reading*. Mahwah: Lawrence Erlbaum Associates. http://doi.org/PE 1128.A2 B4972007

Boudelaa, S., & Marslen-Wilson, W. D. (2001). Morphological units in the Arabic mental lexicon. *Cognition*, *81*(1), 65–92. http://doi.org/10.1016/S0010-0277(01)00119-6

Chen, H.-C., Vaid, J., Bortfeld, H., & Boas, D. A. (2008). Optical imaging of phonological processing in two distinct orthographies. *Experimental Brain Research*, *184*(3), 427–33. http://doi.org/10.1007/s00221-007-1200-0

Crosbie, S. (2014). *Linguistic diversity: alive and well in our Dhofari student population*. Paper presented at Beyond Methods Rustaq College of Applied Science, Oman

Dweik, B., Abu Al Hommos, M.D. (2007). The effect of Arabic proficiency on the English writing of bilingual Jordanian students. *Online submission: Eric ED497505*.

Eviatar, Z., Ibrahim, R., & Ganayim, D. (2004). Orthography and the hemispheres: visual and linguistic aspects of letter processing. *Neuropsychology*, *18*(1), 174-84. http://doi.org/10.1037/0894-4105.18.1.174

Facoetti, A., Paganoni, P., & Lorusso, M. L. (2000). The spatial distribution of visual attention in developmental dyslexia. *Experimental Brain Research. Experimentelle Hirnforschung. Expérimentation Cérébrale*, *132*(4), 531–8. http://www.ncbi.nlm.nih.gov/pubmed/10912834

Farid, M., & Grainger, J. (1996). How initial fixation position influences visual word recognition: a comparison of French and Arabic. *Brain and Language*. http://doi.org/10.1006/brln.1996.0053

Fender, M. (2003). English word recognition and word integration skills of native Arabic- and Japanese-speaking learners of English as a second language. *Applied Psycholinguistics*, *24*(02), 289–315. http://doi.org/10.1017/S014271640300016X

Garzia, R. P., Borsting, E. J., Nicholson., S. B., Press, L. J., Mitchell, M. S., & Solan, H. A. (2008). Care of the patient with learning related vision problems: reference guide for clinicians. American Optometric Association.

Goldstein, D. (1999). *NLD Rating Scale*. http://www.nldontheweb.org/nldentrylevelreading/nldratingscale.html

Hayes-Harb, R. (2010). Native Speakers of Arabic and ESL texts: evidence for the transfer of written word processes identification. *TESOL Quarterly*, *40*(2), 321-339.

Hong-Nam, K., & Leavell, A. G. (2006). Language learning strategy use of ESL students in an intensive English learning context. *System*, *34*(3), 399-415. http://doi.org/10.1016/j.system.2006.02.002

Ibrahim, M. H. (1978). Patterns in Spelling Errors. *ELT Journal*, *XXXII*(3), 207–212. http://doi.org/10.1093/elt/XXXII.3.207

Khelifa, M. (2009). Reflective practice in a cross-cultural university setting: a theoretical model. *Teaching in Higher Education: Gulf Perspectives*, *6*(1).

Lanthier, S. N., Risko, E. F., Stolz, J. a, & Besner, D. (2009). Not all visual features are created equal: early processing in letter and word recognition. *Psychonomic Bulletin & Review*, *16*(1), 67–73. http://doi.org/10.3758/PBR.16.1.67

Lovering, M. (2012). *Beyond the veil: a case study of context, culture, curriculum and constructivism at Dubai Women's College*. Brock University.

Mayer, R. E. (2009). *Multi-media learning* (2nd ed.). Cambridge University Press.

Miller, G. A. (1956). The magical number seven, plus or minus two. *The Psychological Review*, *63*(2), 81-97.

Pallant, J. (2011). *SPSS Survival Manual* (4th ed.). Sydney: Allen& Unwin.

Pelli, D. G., & Tillman, K. A. (2007). Parts, wholes, and context in reading: a triple dissociation. *PLoS ONE*, *2*(8), 8. http://dx.doi.org/10.1371/journal.pone.0000680

Pollatsek, A., & Rayner, K. (2005). Reading. In K. Lamberts & R. L. Goldstone (Eds.), *The Handbook of Cognition* (pp. 276–293). London: SAGE Publications Inc.

Quinn, J. M., & Wagner, R. K. (2015). Gender differences in reading impairment and in the identification of impaired readers: results from a large-scale study of at-risk readers. *Journal of Learning Disabilitiesisabilities*, *48*(4), 433-445. http://doi.org/10.1177/0022219413508323

Rahal, T. (2010). Learning styles: learning that empowers students?. *Learning and Teaching in Higher Education: Gulf Perspectives, 7*(2). http://dx.doi.org/10.18538/lthe.v7.n2.45

Randall, M. (2007). *Memory, psychology and second language learning*. John Benjamins.

Randall, M., & Meara, P. (1988). How Arabs read roman letters. *Reading in a Foreign Language*, *4*(2), 133-145.

Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, *124*(3), 372–422. http://www.ncbi.nlm.nih.gov/pubmed/9849112

Rosselli, M., & Ardila, A. (2003). The impact of culture and education on non-verbal neuropsychological measurements: A critical review. *Brain and Cognition*, *52*(3), 326-333. http://doi.org/10.1016/S0278-2626(03)00170-2

Ryan, A., & Meara, P. (1992). The case of the invisible vowels: Arabic speakers reading English words. *Reading in a Foreign Language*, *7*, 531-531. http://nflrc.hawaii.edu/RFL/PastIssues/rfl72ryan.pdf

Schnotz, W. & Kürschner, C. (2007). A reconsideration of Cognitive Load Theory. *Educational Psychology Review*, *19*(4), 469-508. http://doi.org/10.1007/s10648-007-9053-4

Sonleitner, N. (2005). Western-educated faculty challenges in a Gulf classroom. *And Teaching in Higher Education: Gulf*, *2*, 1-21. http://www.zu.ac.ae/lthe/vol2no1/lthe02_02.pdf

Sperry, L. (Ed.). (2012). *Family assessment: contemporary and cutting-edge strategies*. New York: Routledge Taylor & Francis.

Sweller, J., van Merrienboer, J. J. G. & Paas, F. G. W. C. (1998). Cognitive Architecture and Instructional Design, *10*(3), 251-296.

United Nations Development Organisation. (2004). *Arab Human Development Report 2004 Development*. *Arab Human Development Report*. Amman: SYNTAX.

Vaid, J., Rhodes, R., Tosun, S. & Eslami, Z. (2011). Script Directionality Affects Depiction of Depth in Representational Drawings. *Social Psychology*, *42*(3), 241-248. http://doi.org/10.1027/1864-9335/a000068

White, S. J., & Liversedge, S. P. (2006). Linguistic and nonlinguistic influences on the eyes' landing positions during reading. *Quarterly Journal of Experimental Psychology (2006)*, *59*(4), 760-782. http://doi.org/10.1080/02724980543000024

Wightwick, J., & Gaafar, M. (2005). *Mastering Arabic script: a guide to handwriting*. London: Palgrave MacMillan.

Yeung, A., Jin, P., & Sweller, J. (1998). Cognitive load and learner expertise: split-attention and redundancy effects in reading with explanatory notes. *Contemporary Educational Psychology*, *23*(1), 1-21. http://www.ncbi.nlm.nih.gov/pubmed/9514686