Curriculum and assessment mismatch: Examining the role of images in literacy assessments

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ABSTRACT

In light of the shift towards incorporating multimodality in the curriculum, it is of interest and value to examine the extent to which multimodal literacy is assessed in national and international literacy tests. This is so as to surface any misalignment between the two and highlight gaps which curriculum planners and assessment designers can address. Given the significant influence that the nature of assessment has in shaping classroom practices and teaching priorities, it is imperative that assessment is aligned with curriculum goals. Our paper examines the assessment items in the visual text comprehension in Singapore's national examinations, the Graduate Certificate of Education Ordinary Level (GCE O' Level) and the Primary School Leaving Examination (PSLE), for the English Language exam, as well as the literacy components of Programme for International Student Assessment (PISA) and Progress in International Reading Literacy Study (PIRLS) reading items. We adopt the approach of an earlier study by Unsworth et al. (2019) and position our work as a replication study, extended to a new context. In adopting a common approach, we hope to offer an independent verification of the framework, analyses and findings from the earlier study and contribute towards consolidating and building up proven practices in the analysis of text-image relations within the field of multimodal studies. Our results similarly show an overall low proportion of test items that deal with images and image-language relations in the Singapore and international assessments. While the proportion of questions where the image is essential or supports answering the question is higher for the Singapore GCE O' Level exams, the role of images in the PSLE and international assessments is limited, which suggests a greater focus on assessing multimodal literacy is required. As curriculum reforms to incorporate multimodality in education become more commonplace around the world, we argue that attention on assessment must be the next frontier of change.

Introduction

Modern communication is increasingly saturated with multimodal resources that make meaning through semiotic modes such as language, images, animation, and music, in both online and physical spaces. Before the turn of the century, Mitchell (1995) describes a 'visual turn' (p. 11), in light of the heightened role that images play in our culture, while Jewitt (2009) later refers to a 'multimodal turn' (p. 4). To be able to navigate this multimodal communication environment therefore requires students developing proficiency in new literacy practices.

Scholars have advocated for the incorporation of multimodality in education and called for a broadening of formal school curriculum to include meaning-making across different semiotic modes (New London Group, 1996). In particular, much attention is paid to describing and understanding the increasingly central role of visual elements and images in meaning-making, with images complementing, even substituting, written text in everyday communication (Unsworth, 2014a). As Unsworth (2014a) observes, image-language interaction and integration have become 'crucial dimension(s) of literacy learning and development' (p. 26). The

traditional 'concept of reading' in language learning must be expanded 'to embrace the negotiation of multimodal texts' (Unsworth & Chan, 2009, p. 245).

In schools, the curriculum must similarly evolve beyond just the teaching and assessing of reading in print to reading multimodal texts. As Unsworth (2017) explicates, there is a 'need to reconceptualise reading comprehension to take account of the ways in which images and image–language interaction contribute to the meanings that can be made from texts' (p. 100). With this, an emerging body of work examines approaches and pedagogies to develop teachers' and students' multimodal awareness and competence in the language classroom (Chia & Chan, 2017; Liang & Lim, 2020; Lim et al., 2015; Lim & Tan, 2018; Macken-Horarik et al., 2017; Towndrow et al. 2013; Unsworth, 2014b). Among these, multimodal literacy (Jewitt & Kress, 2003; van Leeuwen, 2017; Lim, 2018) is about students learning to view multimodal texts critically and to communicate effectively through multimodal representations. Multimodal literacy involves exploring and understanding the affordances of the different meaning-making resources, as well as how they work together to produce a coherent and cohesive multimodal text.

Recent research has focused on the representation of multimodality, specifically image-language relations, in formal national and international assessment. Unsworth et al. (2019), published earlier in this journal, analysed international tests such as the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) and reported that while there are assessment items which addressed images and image-language relations in these international assessments, the Australian National Assessment Programme in Literacy and Numeracy (NAPLAN) reading test contained a particularly low proportion of test-items that included images and image-language relations. Unsworth et al. (2019) described this as the 'educational chasm' that divides the Australian Curriculum: English (ACE) which 'is permeated with detailed requirements for students to develop multimodal literacy… [and] the very substantially monomodal literacy assessments of the reading tests of the NAPLAN' (p. 128). Through the analysis of the role of images in answering the questions, Unsworth et al. (2019) highlight this divide and argue that NAPLAN is not commensurate with the syllabus requirements in recognising knowledge of image-language integration. The 'monomodal nature' (Unsworth et al., 2019. p. 131) of the NAPLAN reading test items also differed from the greater proportion of test items that addressed image-language relations in large scale international assessments, such as the TIMSS, PISA, and Progress in International Reading Literacy Study (PIRLS).

Our paper replicates the approach and applies the coding scheme developed by Unsworth et al. (2019) to pursue two main objectives: the first, to examine the extent to which multimodal literacy is being addressed in Singapore's national examinations; and the second, to contribute to the discussion involving the treatment of image-language relations in the PISA and PIRLS reading assessments and how this compares with Singapore's national assessment items. PISA and PIRLS are familiar to Singapore students as they routinely participate in the international benchmarking of their reading achievements against other countries. Given the high regard of these assessments and their use in Singapore, the comparison between them and the national examinations can be revealing of the extent in which multimodal literacy is assessed for Singapore students.

Image-language interaction in national curricula and assessments

Several educational systems, such as in Australia, Canada, the USA, Singapore and Sweden, have expanded their curriculum beyond a focus on language to include how other semiotic modes are used in communication. This is expressed in the curriculum requirements for students to understand how images make meaning and the interplay between language and images in a multimodal text (Unsworth et al., 2019). For example, the ACE explicates the need for students to demonstrate awareness and understanding of image-language interplay in multimodal texts, by exploring and explaining the combinations of language and visual choices that authors make to present information, opinions and perspectives in different texts (Unsworth, 2014a, p. 27; Unsworth, 2017, p. 101). In Singapore, as stipulated within the English Language Syllabus 2010 (ELS 2010), the Learning Outcomes (LOs) for the language learning area of Reading and Viewing include being able to 'construct meaning from visual texts (e.g., pictures, diagrams, charts, icons, maps, graphs, tables)'; 'identify and analyse techniques (e.g., colour, pictures, sound effects) used in written and visual texts to achieve a variety of purposes'; as well as 'identify the meaning conveyed by the interplay of what is written and the visuals in a text' (Ministry Of Education [MOE], 2008, p. 38, 39, 43).

While several national curricula and syllabi have accorded increasing recognition and emphasis on the importance of multimodal literacy teaching and learning, research (Unsworth, 2014a, 2017; Unsworth et al., 2019) have shown that in several contexts,

including Australia, the UK and the USA, an 'educational chasm' (Unsworth et al., 2019, p. 128) – also referred to as a 'multimodality chasm' (Unsworth, 2017, p. 102) – exists between the national curriculum and the respective national literacy assessment practices in terms of the 'minimal attention [paid] to assessing students' reading of images' (Unsworth et al., 2019, p. 128). National literacy and reading assessments have more often than not failed to address 'the reality of the prominence of multimodal texts in lives of students' (Unsworth, 2017, p. 100), resulting in a glaring discrepancy where the assessment practices do not respond to expected curriculum outcomes. To illustrate this argument, Unsworth (2017) compared the curriculum requirements and publicly available samples of the USA's 2015 National Assessment of Educational Progress (NAEP) and found that the reading assessment items completely neglected the testing of students' understanding of how images contributed to meaning-making.

By quantifying the low proportion of test items addressing image-language relations in the Australia NAPLAN reading tests and juxtaposing this against the much higher proportions in international literacy assessments, Unsworth et al. (2019) highlighted the incompatibility of the NAPLAN assessment with the multimodal requirements of the Australia national English curriculum, and the multimodal nature of communication. The results of this study challenged NAPLAN's 'curriculum validity… on the basis of [its] failure to reflect the multimodal literacy requirements of mandated curricula' (Unsworth et al., 2019, p. 129). The authors urged further action in designing 'a more curriculum responsible national literacy test regime' that 'optimise[s] curriculum implementation and achieve[s] the multimodal literacy outcomes intended for students' (p. 137).

Research objectives

The present study follows from Unsworth et al. (2019) to pursue two main research objectives. Firstly, we replicate the approach in Unsworth et al. (2019) by adapting their coding scheme shown in Table 1 and applying it to a corpora of visual text reading comprehension test items extracted from the English Language (EL) national examinations conducted annually in Singapore, to ascertain the extent to which Singapore's literacy testing practices are (mis)aligned with curricular intentions in addressing multimodal literacy.

The present study also seeks to expand on the discussion involving PISA and PIRLS reading items, by first referring to the PISA and PIRLS Reading Frameworks to examine their treatment of image-language relations (i.e., whether image-language relations are included as one of the assessment objectives for PISA and PIRLS reading tests). Sample reading test items from the most recent iterations of PISA and PIRLS assessments are then similarly analysed using the coding scheme shown in Table 1, serving as a comparison against Singapore's national EL examination questions in terms of the extent to which image-language relations are adequately represented in the test items.

Methodology

Unsworth et al. (2019) devised a set of codes to categorise and quantify the various types of reading test items in terms of the degree to which the assessment materials and test items 'addressed images and image-language relations such that effectively comprehending these is necessary for correct responses to test items' (p. 131). Table 1 shows their coding scheme, which we applied for the analysis of the test items in our study. Following Unsworth et al. (2019), tables were considered as linguistic text, while graphs and taxonomies were considered as images.

Table 1. Coding scheme for analysis of test items (Unsworth et al., 2019, p. 133)

Category	Definition	Description
Yes	Image is essential to answer the question	The answer can only be completed by looking at the image. The answer cannot be found in any of the written text which might be present.
No	Image is not needed at all to answer the question	The reading text or test item contains an image but the answer can only be found by reading the written words.
Supports	Image might help to infer the answer	The answer can be found in the written words, although the image content is considered as a visual prompt in conjunction with the text in helping to answer the question. The image might prompt contextual knowledge.
References	Image is required for a minor detail	The image content is not needed to answer the question, but the image needs to be referred to in order to find a detail to answer the question, for example, the name of an object.

Table 1 (continued). Coding scheme for analysis of test items (Unsworth et al., 2019, p. 133)

Category	Definition	Description
Image in answer	The answer contains one or more images	The answer is composed of one or more images.
No image	There is no image present in the question or answer	The test item is composed only of written text. No image is present.

The data for the Singapore national examinations is retrieved from original past year examination papers that have been made publicly available for sale through a vendor, the Educational Publishing House, in Singapore bookstores. The prevailing practice for the Singapore Examinations and Assessment Board is to have the previous three years of examination papers for the PSLE and previous ten years of examination papers for GCE O' Level available in the market. At the time of the purchase, all the most recently available original past year examination papers are used for the analysis in the study.

The first data set being analysed in this study consists of:

- three full sets of PSLE English Language (EL) visual text comprehension test items from 2017 to 2019 (data extracted from Singapore Examinations and Assessment Board [SEAB], 2020b); and
- seven full sets of GCE O' Level EL visual text comprehension test items from 2013 to 2019 (data extracted from SEAB, 2020a). Note that although the full exam papers from 2010 to 2019 are available, the 2010 to 2012 O' Level exams did not include the visual text comprehension section. Therefore, only items from the visual text comprehension section of the 2013 to 2019 exams are included in the present study.

The earlier study by Unsworth et al. (2019) analysed test items from PIRLS reading tests, as well as TIMSS and PISA *science* tests. In keeping with our study's focus on *reading* tests, an updated data set consisting sample PISA and PIRLS reading test items from PISA (2018) and PIRLS (2016) are examined. The second data set analysed in this study consists of:

- four sets of 2018 PISA released field trial reading items (extracted from Organisation for Economic Co-operation and Development [OECD], 2019a),
- two sets of 2016 sample PIRLS passages and questions (extracted from International Association for the Evaluation of Educational Attainment [IEA], 2015),
- two sets of 2016 sample PIRLS Literacy passages and questions, with PIRLS Literacy being a less difficult version of PIRLS that assesses foundational reading skills (extracted from IEA, 2015), and
- two sets of 2016 sample ePIRLS texts and questions[1].

While the actual PISA and PIRLS assessment items are not publicly accessible for analysis, these sample PISA, PIRLS, PIRLS Literacy and ePIRLS assessment items are available for public download from the official websites of the OECD, and the IEA, which oversee the PISA and PIRLS assessments respectively. Given that these sample items are to provide a guide to what the actual PISA and PIRLS assessments will be like, we posit that the sample items are sufficiently representative of the actual assessment items and would thus provide an indication of the extent to which multimodal literacy is assessed.

In our study, two independent raters completed the coding of all data from the PSLE, GCE O' Level, PISA and PIRLS assessments separately, before coming together for discussions to resolve any differences in applying the coding scheme. The two raters initially agreed on 82.4% of the total of 188 items analysed across the four types of assessments. The two raters mainly differed in the treatment of images which played insignificant roles in the derivation of answers. For example, there were some questions where, even if the test takers chose to ignore the image entirely, they could still manage to derive the correct answer from very careful reading of the linguistic text. The first rater tended to code these questions under NO, while the second rater coded these under SUPPORTS. Following discussions, the two raters agreed that while the answers were found primarily in the language rather than the image, the image could arguably serve as a 'visual prompt' (Unsworth et al., 2019, p. 133) to help in answering the question. The first rater later adjusted the coding of these questions from NO to SUPPORTS. The two raters achieved 100% agreement following the discussions and adjustments. It should be noted that with regard to the image-support items, the degree to which the images support written language in conveying

1. The sample PISA items were downloaded from http://www.oecd.org/pisa/test/PISA2018_Released_REA_Items_12112019.pdf.
The sample PIRLS and PIRLS Literacy items were downloaded from https://timssandpirls.bc.edu/pirls2016/downloads/P16_Framework_2ndEd.pdf.
The sample ePIRLS items are available online at http://timssandpirls.bc.edu/pirls2016/international-results/epirls/take-the-epirls-assessment/.

meaning can differ, in that some images support the conveyance of meaning to a greater extent and some in a very marginal way. It is for this reason that the two independent raters initially differed in their treatment of the arguably negligible visual elements. In other words, the SUPPORTS category potentially encompasses a range of items where the images bear varying semiotic loads.

The case of Singapore: Expansion of the 2010 English Language Syllabus

In recognition of the increasing importance of images as resources for meaning-making in today's communication environment, Singapore's 2010 English Language Syllabus (ELS 2010) was updated and enriched, and introduced Viewing and Representing skills alongside the traditional areas of language learning (AoLLs) of Reading, Writing, Listening and Speaking. ELS 2010 encouraged teachers to bring into the English classroom a variety of print and non-print resources, such as newspapers, photographs, print advertisements, online articles, blogs, wikis, films and create opportunities for students to engage with and create multimodal texts (MOE, 2008). ELS 2010 stipulates that by the end of primary and secondary education, students should be able to listen, read and view critically and widely, as well as represent ideas in a range of multimodal texts and texts forms. Table 2 lists some of these learning outcomes stated in ELS 2010:

Table 2: Examples of learning outcomes for the development of multimodal literacy as stipulated in ELS 2010 (MOE, 2008)

AoLLs	Learning outcomes (Skills, Strategies, Attitudes, Behaviour)
Listening and viewing	Interpret the auditory and visual cues that enhance the comprehension of texts (e.g. actions, gestures, shapes, sizes)
Reading and viewing	Construct meaning from visual texts (e.g. pictures, diagrams, charts, icons, maps, graphs, tables) Identify and analyse techniques (e.g. colours, pictures, sound effects) used in written and visual texts to achieve a variety of purposes
Speaking and viewing	Support ideas and points of view by integrating selected visual and/or audio resources, verbal and/or non-verbal cues…to convey meaning appropriate to purpose and context
Writing and representing	Select and use language for effect … through appropriate and varied: Typographical and visual features (e.g. arrangement of text in a particular shape in poetry, letter/work position, line length and font type, colour and size)

Data set 1: Singapore's PSLE and GCE O' Levels EL examinations

Students in Singapore sit for national examinations at three different points throughout their education: all 12-year-olds take the Primary School Leaving Examination (PSLE) at the end primary education; most 16 to 17-year-olds take the Singapore Cambridge General Certificate of Education (Ordinary Levels), or GCE O' Levels for short, at the end of their secondary education; and some 18-year-olds, who have not chosen the vocational route through a polytechnic or institute of technical education, will take the Singapore Cambridge General Certificate of Education (Advanced Levels), or GCE A' Levels for short, at the end of their pre-tertiary education. The PSLE is an 'annual placement exercise for students at the end of their final year of primary school education in Singapore' (SEAB, n.d) and is developed by SEAB and MOE, whereas the GCE O' Levels and GCE A' Levels are developed by both SEAB and the Cambridge Assessment International Education. For this present study, we focus on the English Language examination taken at the PSLE and GCE O' Levels, with EL being a compulsory subject at both levels.

Specifically, the EL examination at both the PSLE and GCE O' Levels comprises four papers each, with each paper corresponding to the AoLL of Writing, Reading, Listening and Speaking respectively. Given the present study's aims of analysing image-language representations in the reading comprehension test items, we focus on the PSLE and GCE O' Level EL Paper 2, and more specifically, on the visual text comprehension sections of each paper. The visual text comprehension section typically contains one or two full pages of visual texts, usually presented in the form of an advertisement, poster, flyer, leaflet, brochure, webpage or magazine article. Test takers are expected to answer a series of questions based on the visual text. The visual text comprehension section in the PSLE EL Paper 2 is made up of eight multiple choice questions (MCQs) worth one mark each. Overall, the visual text comprehension section accounts for 8.4% of the total marks for Paper 2, and 4% of the total marks for the PSLE EL examination (SEAB, n.d.). The visual text comprehension section in the GCE O' Level EL Paper 2 consists entirely of

open-ended questions worth a total of five marks. Overall, the visual text comprehension sections accounts for 10% of the total marks for Paper 2, and 3.5% of the entire GCE O' Level EL examination (SEAB, 2017).

Both the PSLE and GCE O' Level assessment objectives make explicit references to understanding the role of images and visual elements in conveying meaning. For instance, the PSLE assessment objectives state that in Paper 2, 'Candidates will be assessed on their ability to use language correctly and to comprehend visual and textual information' (SEAB, n.d., p. 5). The GCE O' Level examination description states that the visual text comprehension will require candidates 'to answer a variety of questions testing comprehension, and on the use of visuals as well as the use of language for impact' (SEAB, 2017, p. 4).

Analysis of PSLE and GCE O' Level visual text comprehension items

The analysis of the PSLE visual text comprehension data set from the past three years point to the limited role of images in conveying the content containing the correct answers. The 2017 visual text was a language-based newsletter article about an environmental campaign, with only one small photograph of monkeys and several small images of recycling bins, a recycling bag and newspapers scattered throughout the article. The 2018 visual text was in the form of a similarly language-based flyer, with a table showing the schedule of special events at a newly opened children's science museum. There were small pictures of laboratory flasks, a robot, a pinwheel and a helicopter positioned around the flyer. The 2019 visual text was in the form of a magazine article, with one large image of a dragon kiln taking up one-third of the first page. As Table 3 shows, none of the images were essential to answering any of the 24 questions from the visual text comprehension section in the past three years' PSLE, and the images were useful in supporting the derivation of the correct answers to merely five out of 24, or 20.8% of the questions, across the last three years' PSLE.

Table 3. [2017-2019 PSLE EL Visual Text Comprehension] Relationship of images to test items

Text-Image Rlnship	YES Image is essential to answer	NO Image is not needed to answer	SUPPORTS Image helps to derive answer	REFERENCES Image needs to be referenced for a detail e.g. object name	IMAGE IN ANSWER	NO IMAGE IN Q or A	Total number of Qs
2019	0	6	2	0	0	0	8
2018	0	7	1	0	0	0	8
2017	0	6	2	0	0	0	8
Total	0	19	5	0	0	0	24

Table 4. [2013-2019 GCE O' Level Visual Text Comprehension] Relationship of images to test items

Text-Image Rlnship	YES Image is essential to answer	NO Image is not needed to answer	SUPPORTS Image helps to derive answer	REFERENCES Image needs to be referenced for a detail e.g. object name	IMAGE IN ANSWER	NO IMAGE IN Q or A	Total number of Qs
2019	2	2	1	0	0	0	5
2018	2	2	1	0	0	0	5
2017	1	3	1	0	0	0	5
2016	1	3	1	0	0	0	5
2015	1	4	0	0	0	0	5
2014	2	3	0	0	0	0	5
2013	2	1	2	0	0	0	5
Total	11	18	6	0	0	0	35

In comparison, the GCE O' Level visual text comprehension test items give more attention to the images. As Table 4 indicates, the GCE O' Level visual text comprehension from 2013 to 2019 always contained at least one question, out of a total of five questions, where the image is essential to the derivation of the correct answer. In other words, for at least 20%of the test items, the answers could only be found in the images. In 2013, 2014, 2018 and 2019, this percentage was 40%. Overall, across the period from 2013 to 2019, 31.4% of the questions were image-essential.

The GCE O' Level multimodal text comprehension often contained questions that directly instructed test takers to refer to a specific image in the multimodal text to infer a certain message or idea that the visual elements were conveying. For example, question 3 of the 2015 O' Level multimodal text comprehension required that students 'Look at the photograph under the heading 'Teaching'. What impression of teaching do you think the photograph aims to present?' As another example, question 2 in the 2017 exam asked that students 'Look at the photograph at the bottom of the webpage. With reference to the section 'Who joins YSEALI?', what idea does the photograph convey about why people join YSEALI?' (YSEALI stands for Young Southeast Asian Leaders Initiative.) Such question prompts define the requirement for test takers to demonstrate reading and viewing skills in interpreting the meanings conveyed by the images, thus operationalising the English Language syllabus requirements for test takers to construct meanings from visual elements and multimodal texts.

Overall, compared to the 20.8% of questions that addressed image-language relations in the PSLE from 2017 to 2019, 48.6% of the questions in the GCE O' Level visual text comprehension from 2013 to 2019 addressed image-language relations, suggesting that the latter set of test items had a stronger focus on the assessment of multimodal literacy. The results show that the focus on image-text relations is stronger for the examinations designed for older students in the GCE O' Level examinations rather than for younger students in the PSLE examinations. While the proportion of questions that addressed image-language relations in the GCE O' Levels is higher than in the PSLE, it must be noted that the visual text comprehension components contribute very little to the total weightage of both the PSLE and GCE O' Level EL examinations, at 4% and 3.5% of the total marks respectively. The low weightage of the visual text comprehension section and the low proportion of image-essential questions from this section, particularly in the PSLE, could have perpetuated the perception among both teachers and students alike that viewing skills are of diminished importance compared to other AoLLs and learning objectives stated in the English Language syllabus (Lim, Towndrow, & Tan, 2021; Lim, Weninger, & Nguyen, 2021). This, we argue, can undermine the curricular intentions to develop multimodal literacy among students.

Analysis of PISA and PIRLS Reading Tests

Our study also examines two international large-scale assessments in terms of their emphasis on image-language interpretations. Singapore students are no strangers to PISA and PIRLS and they have put up commendable showings in the latest iterations of both assessments (Teng, 2018, 2019). Given the regularity in which cohorts of Singapore students participate in these international benchmarking assessments, an analysis of the image-language relations in the range of assessments can reveal the extent to which multimodal literacy is assessed for Singapore students.

PISA assessment objectives and goals

A triennial assessment targeted at 15-year-olds, the latest PISA iteration was conducted in 2018 (OECD, 2018). The PISA 2018 Reading Framework expanded reading literacy requirements in the 21st century (OECD, 2019b) to include digital texts, digital reading literacy and navigational skills. It also acknowledges that 'pictures and graphic images occur frequently in fixed texts and can legitimately be regarded as integral to such texts' (OECD, 2019b, p. 40). Despite the statement, it is observed that the sample PISA items are mostly language-based, with very few, and mostly decorative, images. The sample PISA items are presented in the form of webpages with a combination of MCQs and open-ended questions.

PIRLS assessment objectives and goals

Conducted once every five years as an international standard assessment for reading comprehension for fourth graders, PIRLS assesses reading comprehension processes (Mullis & Martin, 2015, p. 13). Test takers 'may evaluate the mode used to impart information – both visual and textual features – and explain their functions' (Mullis & Martin, 2015, p. 21). PIRLS requires test takers to interpret and critique visual and linguistic modes of meaning-making, including the role of images and how these interact with language.

Among the 2016 sample test items and passages, the PIRLS and PIRLS Literacy assessments contained a mix of narrative fictional and informational texts. 2016 also saw the introduction of ePIRLS, which is 'a computer-based assessment focusing on the informational reading purpose and designed to assess fourth

grade students' ability to use the Internet in a school context' (Mullis & Martin, 2015, p. 22). The texts used for ePIRLS have been designed and presented in a form closely resembling actual informational webpages. The ePIRLS texts are contain rich visual, dynamic, animated and interactive elements, hyperlinks and pop-up windows that require test takers to demonstrate their ability and familiarity with navigating these non-linear texts, at times moving back and forth between several webpages to source for the correct answers, and at other times, hovering or rolling over features in the webpages for information. Compared to the PIRLS and PIRLS Literacy assessment items, the ePIRLS text environment is multimodally richer and has more images used in the test items. In this, ePIRLS uses a digital medium which arguably offers an especially apt platform for assessing multimodal literacy.

Data set 2: Analysis of PISA and PIRLS sample reading items

Applying the same coding scheme from Table 1 and the same coding process to achieve inter-rater agreement as described in the Methodology section, the data from both PISA and PIRLS are analysed. Table 5 shows the breakdown of the types of questions found in the PISA and PIRLS sample test items in terms of the extent to which image-language relations are addressed by the items. In contrast with what Unsworth et al. (2019) concluded with the 2015 PISA *science* items, the 2018 sample PISA *reading* items analysed in the current study hardly addressed image-language relations. There were no image-essential questions among all 28 items, while images supported the derivation of answers in only two items; images were not even present in six items. The assessment items provided were mostly language-based with very few, small images inserted for ornamental purposes. The negligible presence of visual elements in the test items, together with the minimal mention in the PISA 2018 Reading Framework of the role of images in conveying meaning, collectively indicate a gap in the test constructs of the PISA reading assessments in addressing multimodal literacy. This differs from what Unsworth et al. (2019) concluded regarding the 2015 PISA *science* items, where they found that among the test items which contained an image, 53% were image-essential questions, while 23.5% were image-support questions. In contrast, our analysis based on the 2018 sample PISA *reading* items reveal how the PISA reading test remains mainly a written language reading test with a weak focus on multimodal literacy.

Table 5: [2018 PISA, 2016 PIRLS, PIRLS Literacy, ePIRLS] Relationship of images to test items

Text-Image Rlnship	YES Image is essential to answer	NO Image is not needed to answer	SUPPORTS Image helps to derive answer	REFERENCES Image needs to be referenced for a detail e.g. object name	IMAGE IN ANSWER	NO IMAGE IN Q or A	Total number of Qs
2018 PISA trial reading items	0	20	2	0	0	6	28
2016 PIRLS sample	1	22	6	1	0	0	30
2016 PIRLS Literacy sample	1	18	15	0	0	0	34
2016 ePIRLS sample	1	26	7	0	0	3	37
2016 PIRLS TOTAL	3	66	28	1	0	3	101

The 2016 sample PIRLS, PIRLS Literacy and ePIRLS items fared slightly better in terms of addressing image-language relations compared to the PISA data set, with 30.7% of the test items, or 31 out of 101 items, containing images that were either essential to (YES) or SUPPORTS the derivation of the correct answers. Even so, the number of image-essential questions is still very minimal, making up only three out of all 101 questions,

or slightly less than 3%. In comparison, Unsworth et al.'s (2019) analysis of the 2011 PIRLS showed that image-essential questions made up 9% of the items. One example of an image-essential item would be a question from the 2016 sample PIRLS that instructed test takers to 'Look at the two pictures of the Iguanodon. What do they help you to understand?' (An iguanodon is a type of dinosaur.) It was thus necessary for test takers to compare and contrast the two given pictures of iguanodons to trace how scientific understanding of iguanodons have changed over the years. In another example of an image-support question from the sample ePIRLS, a diagram of the solar system is presented. Test takers must identify the three planets that are positioned between the Sun and Mars. Test takers can work out the answers by referring to both the diagram showing the planets in the solar system lined up in sequence, and the information presented in the text box at the bottom left corner. The image thus SUPPORTS test takers in the derivation of the correct answer. We opine that the role of the image could be further foregrounded with some tweaks to the design of the item. By removing the text box listing the planets in sequence based on their position from the Sun, the diagram of the solar system can be elevated as the primary carrier of meaning and contains all the necessary information essential to answering the question. The sample 2016 PIRLS included one image-reference question: test takers were instructed to look at the paragraph next to a small picture of a piece of pie to identify a certain detail from the narrative. Here, the picture of the pie simply served to mark out the relevant paragraph that test takers should pay attention to. The picture of the pie itself did not carry any content that constituted the answer. Overall, the 2016 sample PIRLS, PIRLS Literacy and ePIRLS assessments show evidence of addressing image-language relations in a higher proportion of test items (30.7%) compared to the 2018 sample PISA items (7.1%), and reflect a stronger emphasis on multimodal literacy. Notwithstanding, the proportion of image-essential questions, while present, is still low in PIRLS.

Discussion

The findings from the analysis of each set of data is discussed with reference to their respective assessment frameworks, to draw conclusions about how closely the test items address the assessment objectives. Overall, this study has found that image-language relations received more attention in the Singapore GCE O' Level English language examination compared to the PSLE. Likewise, the sample PIRLS reading items analysed in this study better addressed image-language relations compared to the sample PISA reading items examined.

While visual texts have already been incorporated into the Singapore national EL PSLE and GCE O' Level examinations, the gap surfaced from this study between curriculum goals and assessment practices with regard to image-language interactions can offer points for contemplation. Between the two sets of Singapore national examinations, the PSLE has a weaker focus on the assessment of multimodal literacy, as evident from the weak emphasis on image-language representations (only 20.8% of items addressed image-language relations compared to 48.6% of the GCE O' Level items). From the O' Level data set, while there were relatively more assessment items focusing on image-language relations, it is observed that image-essential questions typically made up less than half of the total number of items. With the PSLE, in the case of the 2017 and 2018 exams especially, the language-centred assessment items, with small, peripheral image elements, do not bear very close resemblance to the multimodal texts that test takers are exposed to in their daily lives (Weninger, 2019). This potentially reduces the content validity and authenticity (Unsworth, 2017) of the PSLE visual text comprehension for younger students as compared to the GCE O' Levels for older students.

Moreover, test items from the visual text comprehension section only make up a very small proportion of the overall marks of the entire EL examination. This diminishes the importance of the visual text comprehension section in comparison to other weightier components such as composition writing and oral communication, and by extension, undermines the importance of viewing skills as compared to the traditional skills of literacy – writing, reading, listening and speaking. The low weightage is of concern considering how both the PSLE and GCE O' Level examinations are considered high-stakes; the results from both are used to determine advancement pathways and opportunities to the next level of education in Singapore (Albright & Kramer-Dahl, 2009; Curdt-Christiansen & Silver, 2013; Lee et al., 2016). It is well-established that high-stakes national testing can lead to the 'reductionist' practice known as 'teaching to the test' (Klenowski, 2011, p. 80), where 'curricular content is narrowed to tested subjects' and 'subject area knowledge is fragmented into test-related pieces' (Au, 2007, p. 258). Given the significant influence that the nature of assessment has in shaping classroom practices and teaching foci, the weak focus on the assessment of multimodal literacy in Singapore's national examinations warrant attention from curriculum planners and assessment designers to align assessment design with curricular intent.

Testing authorities must recognise that the relative weighting assigned to different components in a national examination signals to both teachers and test takers which specific skills and knowledge they ought to prioritise when preparing for and completing the examination. If the curricular intent is the development of multimodal literacy through strengthening critical viewing and effective representing skills among students, a corresponding emphasis on assessing the relevant skills and knowledge should be reflected in the national examinations, such that examinations are geared towards the curriculum outcomes and achieve a high degree of 'curriculum relevance and responsibility' (Unsworth et al., 2019, p. 128). This is not to make an impractical case for equal weightage between language-based literacy and multimodal literacy in the national examinations as the goal of the English Language syllabus remains rightfully on language learning as foundational. However, given the syllabus' expanded definition of literacy, expressed with the inclusion of multimodal literacy in the form of viewing and representing with multimodal texts, the assessment weightage should be commensurate with the emphasis given to it in the curriculum, and not be overwhelmingly skewed. At present, where the overall assessment weightage is at 4% or less, the effect of this weak signaling to teachers and students may undermine the curricular goals of broadening the syllabus to include multimodal literacy. Conversely, a calibrated increase in the weighting of the visual text comprehension sections can bring about in positive washback (Taylor, 2005) in affirming the importance and emphasis on multimodal literacy.

The design of assessment items to test multimodal literacy by having more image-essential items to derive the answer should also be given more attention. Assessment designers could be more deliberate when selecting images and multimodal resources for the visual text comprehension sections. Reading comprehension should 'no longer be thought of as simply negotiating understanding of the wordings of the text' (Unsworth, 2017, p. 10). Reading comprehension test items must be designed to reflect the way that image-language interactions make meanings and assess students' understanding. In order to assess multimodal literacy effectively, the assessment items should not primarily rely on just the linguistic mode to convey meaning, but instead, should consist of more images and a wider range of semiotic modes, be it visual, linguistic, gestural or spatial, hence demanding test takers' attention to multimodal resources present and requiring them to exercise their semiotic awareness when answering the test items (Lim, 2021; Towndrow et al., 2013). More efforts should therefore be placed on sourcing and identifying appropriate assessment items with essential visual elements for use in the visual text comprehension sections, and in designing multiple test items that directly require test takers' consideration of the use and impact of multimodal elements found in the reference texts. For example, in future designs of the assessment, more items could be included where the question prompts specifically instruct test takers to refer to a particular image or photograph in the visual text, to infer a certain message or idea that the visual elements are conveying. Such question types are already present in the GCE O' Level exams as highlighted in the earlier examples from the 2015 and 2017 O' Level exams, but could be included in a higher proportion in future iterations of the O' Levels and also introduced in the PSLE visual text comprehension so that test takers are given greater opportunity to demonstrate their semiotic awareness in making meaning from visual texts.

With regard to the international large-scale reading assessments analysed in this study, more can also be done to increase the emphasis on addressing image-language relations. With the PISA reading test items, considerable efforts are required to revamp the format of the assessment items to increase the presence and role of visual components, and to design well-thought-through questions that directly relate to the ideas and messages conveyed through the visual elements. ePIRLS, on the other hand, while multimodal, has only 1 out of 37 questions that was image-essential. As such, the design of the assessment items that test multimodal literacy can be improved by having more image-essential questions to assess multimodal literacy. The importance of image-language relations could also be further elaborated in both the PISA Reading Framework and the PIRLS Reading Framework to create more explicitly worded assessment objectives addressing the role of images and the interplay of words and visuals in creating meaning.

In terms of future direction, it can be worthwhile to reflect on the medium of the assessments. The contemporary communication environment is not just multimodal but also digital in nature. Given that the national EL PSLE and GCE O' Level examinations are pen and paper tests, they are unable to reflect the richness and complexity of the digital communication environment as well as the literacy practices which students participate out-of-school. In this, direction could be taken from ePIRLS. As the assessment is conducted in the digital environment, ePIRLS is able to assess students' literacies in reading digital texts. As such, ePIRLS arguably reflects the demands and authenticity of the digital communication environment better. Notwithstanding,

it must be acknowledged that not every educational system is ready for digital assessments, as equitable access to technology in some countries remains a challenge. The extent to which a digital platform like ePIRLS can meaningfully exploit the affordances of the digital medium and assess multimodal literacy effectively offers fodder for further study.

Conclusion

Our study builds on and extends the pioneering work of Unsworth et al. (2019) in three ways. First, by applying the same coding scheme to different data sets, we offer a replication study to Unsworth et al (2019). Given the quantitative nature of both studies, a replication study offers an independent verification of the framework, analyses and findings from the earlier study and adds to the credibility of its conclusion. In adopting a common coding approach, we hope to contribute towards consolidating and building up proven practices in the analysis of language-image relations within the field of multimodal studies.

Like Unsworth et al. (2019), our analyses point to inconsistencies between the treatment of image-language relations in national reading curriculum versus both national and international large-scale reading assessments. This is true for both Singapore's recent years' PSLE and GCE O' Level EL examinations, as well as PISA and PIRLS reading items, which could do with a heavier emphasis on addressing image-language relations, especially through image-essential questions that require more effort on the test takers' part in demonstrating multimodal literacy and critical viewing skills.

Second, we also turn the focus to investigating another educational context – Singapore – which has broadened its curriculum to include multimodal literacy. In the Singapore ELS 2010, the areas of language learning have been expanded beyond the familiar areas of reading, writing, speaking and listening, to include the viewing and representing with multimodal texts. As such, there is interest to study if the assessment aligns with the curriculum goals espoused in the syllabus and that there is a corresponding shift in tandem towards assessing multimodal literacy as well. While the discussion in anchored in a single national context of Singapore, and the recent international tests on language learning, this study hopes to continue the conversation started on how assessment practices can more adequately reflect the values and foci of the reformed literacy curriculum.

Finally, our paper endeavours to advance Unsworth et al.'s (2019) position by highlighting the significance of the 'educational chasm' (Unsworth, et al., 2019, p. 128) is present not only in Australia but also Singapore as well as international assessments like PISA and PIRLS. While Unsworth et al. (2019) found that the international assessments fared better than the Australian NAPLAN in terms of addressing image-language relations, our study has surfaced varying degrees of emphasis between the two national examinations (PSLE and GCE O' Levels), as well as between the two international reading assessments (PISA and PIRLS) placed on multimodal literacy.

The discussion in this paper has centred on the national and international assessments, and not the actual pedagogical practices and foci of the teachers in the lessons. However, given the influence that assessment requirements assert on classroom practices (Klenowski, 2011), it is critical to strengthen the alignment between curriculum and assessment goals. Further research could be undertaken to study the extent to which other educational systems in national contexts incorporate multimodal literacy om the curriculum and assessment goals, and if similar mismatches between the curriculum and assessment goals are found. In this, we advance the argument that the next frontier in integrating multimodal literacy beyond curriculum reforms must be corresponding changes in the national and international assessment regime.

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